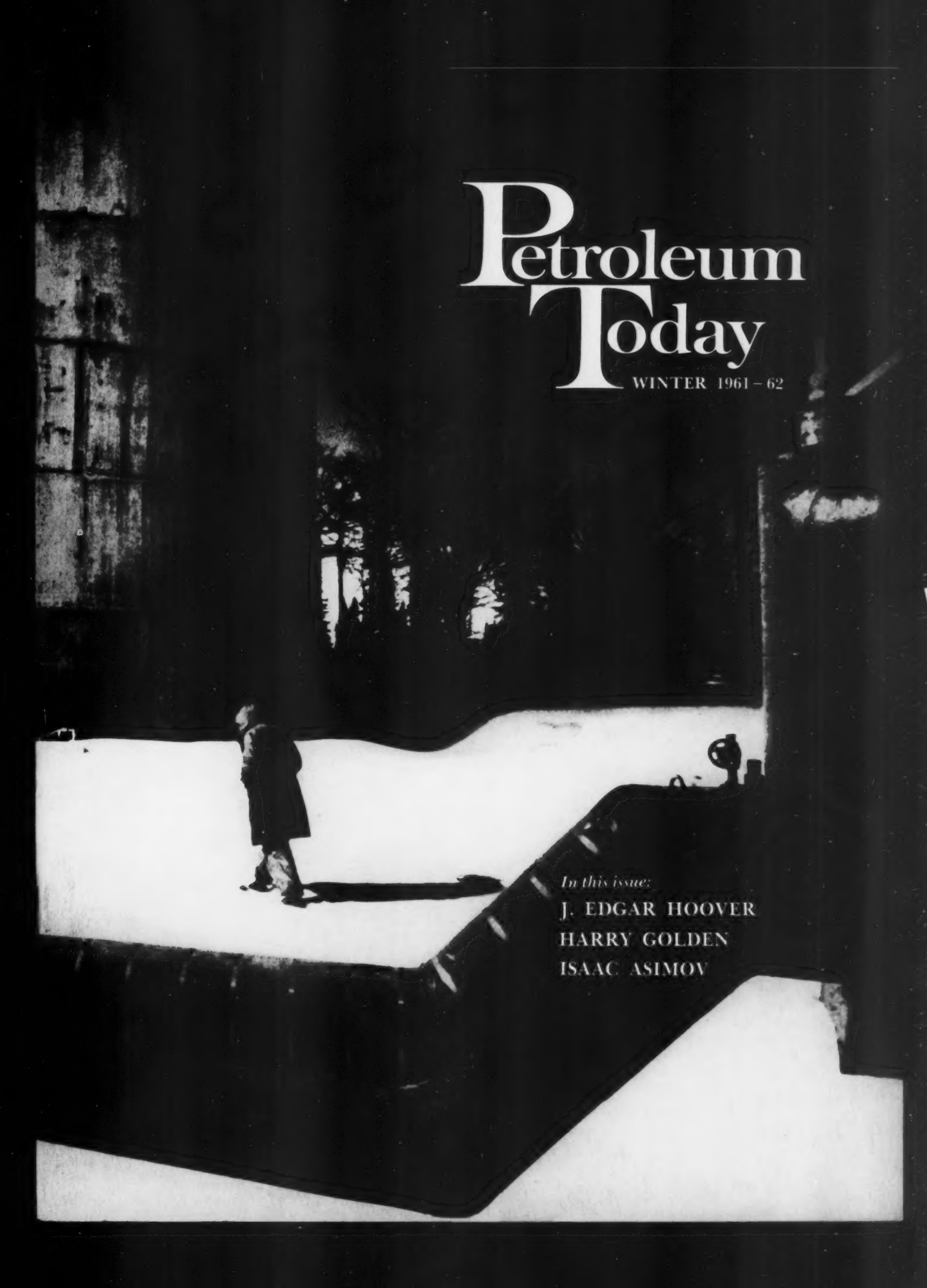

Petroleum Today

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In this issue:

J. EDGAR HOOVER

HARRY GOLDEN

ISAAC ASIMOV

CHALLENGE OF THE KENAI

The peninsula is a land of moose and salmon, of backwoods villages and homesteaders' shacks. Here oilmen are writing a new chapter in Alaska's history.

by W. R. Roberts

Petroleum Today

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The Cover:

As in a play, the solitary figure moves among dark, looming shapes across the bleak, snow-covered stage. The scene is Soldotna on Alaska's Kenai Peninsula. Here storage tanks and pipelines serve the state's only producing oilfield.

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"SEND US your young people," the speaker urged. "Send us your second sons who are not in line to take over your businesses. Send us your imaginative and brave ones who can see the empire that is in the making."

The time was October 1958. Robert Bruce Atwood, editor and publisher of the Anchorage *Times,* was addressing a group of southwestern oilmen. A year earlier other oilmen had brought in the territory's first commercially successful well. Atwood had seen enough of oilmen to know that the brand-new State of Alaska needed more of them.

"Ladies and gentlemen," he said, "I beg of you to always remember that the door to Alaska is open to you. You are invited to come in . . . where the antics of man in the next generation are going to mark up amazing achievements in this marvelous age."

During the three years that have passed since Atwood's talk, oilmen have accepted his invitation. New wells have gone down; oil production has jumped. Petroleum has replaced gold as Alaska's principal mineral. Governor William Egan is quoted as saying that the petroleum industry "has in a large measure assured the financial stability of the 49th State."

The "amazing achievements" of which Atwood spoke have already begun; and nowhere are they more evident than in the Kenai Peninsula, scene of much of Alaska's earliest history, now the center of the state's petroleum production. Here, in a land of moose and salmon, of backwoods villages and homesteaders' shacks, a new chapter in Alaska's history is now being written.

Oilman runs shoran station overlooking Kenai's Cook Inlet.

Surveyor studies frozen land in preparation for oil search.

An Eskimo Legend

The Eskimos have known for centuries that there is oil in Alaska; surface seepages exist in various sections of the land. Eskimo legend holds that the oil spilled from a seal-oil lamp carried by two children who wandered eternally across the country as punishment for having disobeyed their father.

The white men who came to Alaska in the 19th century had other theories. Russian traders and American settlers made note of the seepages. The Klondike gold rush sent amateur miners scattering throughout the land, and many found more signs of oil than of gold.

Wells were drilled, and some oil was produced. But the quantity was limited, and in each case the discovery was abandoned. In the northernmost part of the Territory, the U.S. Government set aside 23 million acres as a Naval Petroleum Reserve in 1923. In later years oil and natural gas were found there, but there was no production in commercial quantities.

Despite such discouragements, Alaskans remained convinced that their land would yield an untold treasure of petroleum. And there were oilmen who agreed. Almost 20 years ago one of them predicted: "Like California, Alaska first attracted the pioneer by its great wealth of gold, but it will not be surprising if Alaska, again like California, eventually produces a still greater wealth in the form of petroleum."

American oil companies invested millions of dollars in dozens of wells. Oilmen worked in temperatures of 30 degrees below zero, whipped by winds of 100 miles an hour. At one site a gust of wind lifted a crew's mud hut over the top of a 142-foot derrick. But one after the other, the wells proved to be spectacularly expensive failures. Even oil executives accustomed to 8 to 1 odds against wildcat wells in the rest of the U.S. began to have their doubts. Then, in 1954, one of the companies active in the Alaskan search launched an exploration program on the Kenai Peninsula. Ironically, this was one part of Alaska where oil seepages had never been known.

Seismic crews probe the Kenai, setting off small dynamite charges to map potential oil-bearing strata below.

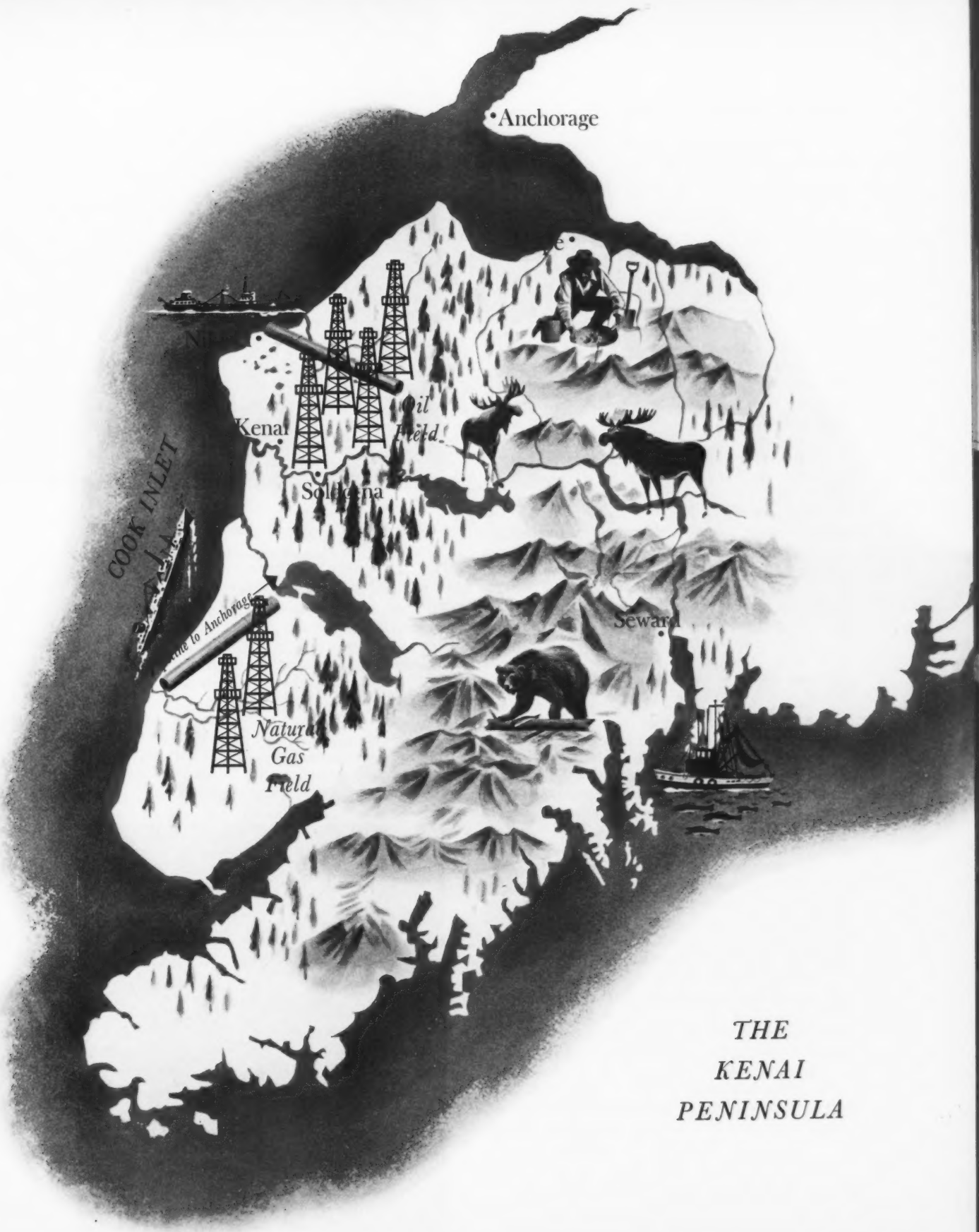
This Is the Kenai

The peninsula juts awkwardly into the Gulf of Alaska. Its 150-mile length is studded with small lakes and heavily veined by rivers. Along its western coast runs the Cook Inlet, named for the explorer who opened these regions while in search of the Northwest Passage.

These are Alaska's southlands, warmed by the Japan Current. The Kenai has a winter mantle of snow but no permafrost; summer temperatures are in the fifties. Wildlife flourishes here; king crab, king salmon, and halibut fill the offshore waters.

The earliest Russian traders hunted sea otter in the Cook Inlet. In 1791 they established the village of St. Nicholas, which later became the town of Kenai. At the top of the inlet is the town of Hope, scene of Alaska's first recorded gold discovery. Seward, in the south, is the Kenai's largest community; the commercial fishing fleet docks here, and big game hunters make it their headquarters. The largest moose in the world and the giant Kodiak bear can be found in the peninsula's interior (thousands of square miles of wildlands including the Kenai National Moose Range).

Oil exploration on the Kenai was at first centered in the southwest, near the Deep Creek River. Geologists also studied a section along the Swanson River, outside the town of Kenai and deep in the heart of the moose range. Exploratory drilling was conducted at both sites. The Deep Creek well went down 14,221 feet; it was the deepest that had ever been drilled in Alaska, but it was dry. The Swanson River well, the earlier of the two, was not so deep, but on September 29, 1957, it found oil.



THE KENAI PENINSULA

The Discovery Well

Swanson River No. 1 it was called. The rig rose out of a clearing in the forest, gray in the gray autumn sky, garnished by a string of lights along its length at night.

The well had cost more than $500,000. Supplies had been brought in by barge and beached on the shore, roads had been cut through the wilderness, seismographic crews had labored for months testing the underground structures, the rig had been set up and operated despite the isolation and the weather—all on the chance that oil lay below.

News of the success of Swanson River No. 1 galvanized the oil industry. Applications for mineral leases poured into the U.S. Bureau of Land Management. A little more than a month after the well came in there were 3,500 such applications awaiting action in Anchorage alone.

Meanwhile drilling continued in what became known as the Swanson River Field. Though the number of dry holes was amazingly high for an area known to contain oil, the new wells were for the most part producers. The oil was located in a rock formation known as the Hemlock Zone (named by a geologist after a stand of trees near the discovery well). But the Hemlock Zone proved to be elusive: six failures were recorded in the immediate vicinity of Swanson River No. 1.

"The geologic structure is so tricky," an exploration superintendent has said, "that if the No. 1 had been drilled just a little ways from where it was drilled, all this might never have happened."

Of Moose and Men

The oil development on the Kenai is unusual by any standard. From the worker's point of view, it is not particularly rough duty. "If you've ever drilled in the Rockies," says a toolpusher, "you wouldn't call this cold. Hardly ever gets below zero."

There are certain discomforts, however. "White socks," for example—tiny gnats that have an affinity for man's ears. Or mud, the thick soup that comes with the spring thaw. "One minute everything's frozen, the next it's a sea of mud. Ever try and put a road through mud?"

The companies operating on the Kenai have experienced another kind of discomfort, of the financial variety. Wells cost upwards of $500,000 each. Five miles of road has been known to carry a $250,000 price tag. The isolation from the mainland necessitates expensive transport of supplies and equipment.

Both workers and companies have had their difficulties with the famous animal population of the peninsula. Drillers carry rifles against a chance meeting with a bear. The moose, normally peaceful animals, present a danger by their very stupidity.

"Hunt moose?" an oilman says disgustedly. "It's like shooting a cow in the barn." One man was driving along the road from his rig when he spotted a moose about to cross the road. He jammed on the brakes, and the car skidded to a halt, its hood directly in the moose's path. The animal never hesitated a moment; he walked right up over the hood

Plans to develop the oil resources of the Kenai were opposed by some conservationists who feared that the moose population would be harmed. Their fears have proved groundless.

Drilling sites on the Kenai are specially prepared to prevent pollution of streams and scarring of the landscape. Waste materials are transported from the site; when the drilling is completed, the sump is filled and the area is covered with topsoil.

of the car, breaking the windshield in the process, and continued on across the road and into the woods.

When the industry first arrived on the Kenai, however, there was more concern for the moose than for the oilmen. A storm of protest arose from conservationists and sportsmen's groups. Industrial operations, it was said, would destroy the forests; the wildlife population would be decimated.

The oilmen reacted with some confusion. "Animals have more value around here than people," a driller claims, only half in jest. "You get a longer jail sentence for shooting a moose out of season than for shooting your wife."

Actually, the exploration and drilling program on the Kenai has had an effect that no one, neither conservationist nor oilman, could have anticipated. For the former, it has demonstrated that oil operations and wildlife can be compatible; for the latter, it has provided a showplace example of the ability and willingness of the industry to adapt to special wildlife conditions.

The Kenai Moose Range is a virgin forest of spruce, lovely to look at but hard on wildlife: the tall stands of spruce shade out the close-to-the-ground shrubs that animals can feed on, leaving a bare, open forest floor. "There is more wildlife in our western deserts," says one naturalist, "than in our really virgin forests."

The moose on the Kenai were given a new lease on life 14 years ago by a forest fire (known locally as the "Big Burn"). By destroying lofty spruce stands, the fire made it possible for the ecological process to start all over again. The moose soon had browse (close-to-the-ground vegetation) to eat in the burned-out areas.

Then the oilmen came through, putting down their roads, clearing sections to set up their rigs. Some citizens groups protested, but conservation leaders soon came to look upon the industrial developments as an opportunity. For example, the companies needed only a 20-foot right of way for their roads to drilling sites; the Fish and Wildlife Service asked that the width be increased to 100 feet. The cut timber was left for the moose to nibble. Then the stripped timber was cleared away and the topsoil returned to place, leaving a wide swath of land where the browse could grow. The wildlife officials recognized another opportunity presented by these roads. They asked the companies to cut side roads to open up new camping grounds and boat launching areas for public recreational use; once again the companies complied.

Public concern was also expressed about activities at drilling sites. The operation requires the digging of large holes (sumps) to hold drilling mud (chemicals used to lubricate the drill bit and to carry chips of rock to the surface of the well). Visions were raised of waste material polluting the lakes and streams of the area.

The companies quieted such fears by explaining what they planned to do—and then doing it. Topsoil was skimmed off the area and set to one side; waste material was pumped into tank trucks and carried away; when the drilling was done, a special matting of timber and topsoil was placed in the sumps. Today drilling sites treated in this manner have a ground cover of browse; all that remains of the giant drilling structure is a set of valves to control the flow of oil and a pipeline to carry the oil to storage tanks. Appropriately enough in this land of spruce, the set of valves is known to oilmen as a "Christmas tree."

The results of the industry's conservation-minded program on the Kenai were recently summed up in an Alaskan newspaper. Said reporter Cameron Edmondson: "Practicing what Russian politicians preach, oilmen, moose and Fish and Wildlife Service agents have created an object lesson in 'peaceful coexistence' within the Kenai National Moose Range." His best answer to those who believed that oil and moose were not compatible: "According to the latest figures of the Fish and Wildlife Service the range's moose population has doubled since 1946, with much of the increase coming during the past five years."

The Fruits of Oil

The relationship between the oilmen and the residents of the Kenai has also been of a delicate nature. Many of the homesteaders, for example, looked askance at the arrival of industry—they had come to the Kenai to get away from it all. Some of the residents of the towns worried about the effects the oil development would have.

Gradually these doubts have been eased. Oilmen and their families have settled in the towns and have been accepted as part of the community. Commercial establishments have prospered. Civic improvements are being made. And some of the homesteaders, who lived on a subsistence level before the oil development, are working in the fields alongside the men from the "Outside."

Prime example of the fruits of oil development is the town of Soldotna. Fourteen years ago there was just a single family homesteading on the site; in 1950 there were approximately 20 people. Today Soldotna has a population of about 1,000, plus motels, restaurants, a bowling alley, a branch bank, and virtually all the appurtenances of a modern, thriving community. The town is headquarters for a number of oil well supply companies and trucking firms.

Kenai, the Oil Capital of Alaska, as she calls herself, is a one-time Russian fishing village. Today trucks carrying drill pipe move along the streets past century-old churches and homes. A large airport services commercial airlines and the ubiquitous private planes that are second nature to Alaskans. The Sterling Highway, which runs through the heart of the peninsula, has its western terminus in Kenai. With the advent of oil, says Alaskan author Lou Jacobin, Kenai "stands today on the threshold of an era of industrial expansion."

Oilmen have found the citizens of the peninsula to be independent but friendly, rugged individualists all. "You walk into Kenai," says a driller, "and you can't tell to look at a guy what he is—a scientist, a homesteader, a doctor." Says another: "When you go into a store, they're just as likely to make you have a cup of coffee before you can buy anything." Then he adds: "Of course, by the same token, if they don't like your looks, they won't give you the time of day."

A drilling superintendent remembers one of the Kenai men who supervised jobs involving the big earthmoving tractors. "Most contractors in the States," he says, "you tell them what to do and they'll do it. This guy, he'd say, 'Well-l-l . . .' Then he'd go ahead and do it his own way. Most of the time he was right."

An editorial in a leading Alaskan paper seems to express the feelings of the residents of this newest of oil lands. The oil developments show, says the editorial, "that Outsiders can and do fit well into local society. The oil people have become an integral part of the community and of Alaska."

Sincere as the many expressions of friendship for the industry may be, the enthusiasm over the oil developments on the Kenai has its roots in economics. The new state has a relatively small industrial base and limited sources of income. These economic weaknesses contributed mightily to the delay in Alaska's achieving statehood.

The discovery of oil opened new financial horizons. The Governor believes that it was "instrumental in providing an economic atmosphere favorable for statehood—not only for the 49th state but, indirectly, the 50th state."

In the past three years oil industry payments

This Russian Orthodox church was built by the Kenai's earliest white settlers more than a century ago. Today it stands deserted and forlorn.

to the state in the form of lease moneys, royalties, and other fees have been more than $23 million. It is expected that during the 1962 fiscal year revenue from oil leases alone will be approximately $7 million—about a quarter of the entire state budget.

Such figures indicate the importance of the oil industry to Alaska's economy today, but they give no hint of the future. The oil developments on the Kenai, most experts believe, are only a relatively small beginning.

The development of nearby petroleum fields has brought new growth and prosperity to the town of Kenai, once a small fishing village, today the self-styled Oil Capital of Alaska.

Current production from the Swanson River Field, for example, is about 23,000 barrels a day. This represents approximately three-tenths of 1 percent of the nation's total daily output. The entire oil production of Alaska is concentrated in an area seven miles long and a mile wide. All this crude oil is handled by a single pipeline 19.5 miles in length, and the pipeline is operated by a grand total of five men.

If an oil development on this scale can result in such benefits, Alaskans ask, what will the future bring? They have cause for optimism. Their state lies in one of the world's four great intercontinental depressions favorable to the recovery of petroleum. One noted geologist has placed Alaska in a class with the Middle East.

A homesteader on the Kenai cuts logs. In the background is a private plane typical of the small aircraft upon which Alaskans rely so heavily.

The oil industry is banking on Alaska's future. Exploration parties are fanning out across the state. Storage facilities have been constructed. Plans for Alaska's first major refinery have been announced. A natural gas pipeline has been laid from wells on the Kenai to Anchorage. A tanker loading station has been constructed at the town of Nikiski to tie in with the crude petroleum pipeline that runs from the Swanson River Field.

The difficulties of operating in Alaska are, of course, considerable. Two of the larger oil firms, for example, have pulled out of the exploration activities after unbelievably expensive drilling failures. The construction of the natural gas pipeline to Anchorage provides another example of the difficulties encountered in Alaska. Covering a distance of only 82 miles, the line was two years in the building and cost $20 million. Major obstacle was the Turnagain Arm, a shallow bay separating the peninsula from Anchorage; 100-mile-per-hour winds and vicious 35-foot tides made the crossing of this body of water a pipeliner's nightmare.

More than one oilman has echoed the words of a drilling contractor, uttered upon seeing a flock of wild geese fly overhead: "They're the only birds in this country with any sense; they know when to go south."

But the vision that editor Robert Atwood set before his audience three years ago still holds. The challenge remains. And among those who are meeting the challenge of the 49th state are those newest of Alaskans, the oilmen.

The Two Lives of David Levine

by Harry Golden

The editor of The Carolina Israelite *tells the story of an immigrant's dream come true. It could have happened, he suggests, "Only in America."*

LEVINE'S SERVICE STATION is located in the heart of the Old South, Macon, Georgia. It is not very different from other service stations, in the South and elsewhere, except for its owner and operator, David Philip Levine.

If you drive your car in to the station, you will see Mr. Levine about his duties. And you are likely to hear him addressed by his customers as follows:

"Rabbi, give me five gallons of gas."

Now David Levine is not a rabbi. That is just the way his customers understand the fact that Mr. Levine is a leader of a synagogue and officiates at services there. Actually, he is a cantor, which is a somewhat different thing though not entirely.

Mr. Levine has lived in Macon some 40 years, and for most of that time he has been a cantor at Sherah Israel Synagogue, chanting the services for holy days and teaching religion to the younger generation. He also is the cantor for the Fitzgerald Hebrew Congregation, in the nearby town of Fitzgerald.

Recently the Macon synagogue lost its rabbi, and David Levine has taken over many of the rabbi's duties. Thus his customers are not so wrong when they call him Rabbi.

Some curious occupations

Cantors and rabbis have worked at some curious occupations throughout the course of Jewish history. I remember a rabbi on the Lower East Side of New York City who was manager of the public baths. But David Levine is probably the only cantor who also operates a service station.

So at first glance it may seem strange that in Macon there is a service station operator who officiates as a rabbi or that the Fitzgerald Congregation's services are conducted by a man who also pumps gasoline. Yet closer inspection reveals that there is something singularly appropriate in David Levine's choice of professions.

Nothing identifies America like the idea of mobility, and the great symbol of mobility is the automobile. Let us understand mobility. It is one of the democratic ideals: it presupposes the individual's ability to move from class to class, from one income level to another level, and from one political party to another political party. A mobile and fluid social structure has always been the American ideal. Mobility is also—and this is important—the going from place to place. The two traditions that distin-

guish America from all other nations are the frontier tradition and the immigrant tradition. For the first century and a half of our life we had a western frontier that seemed ever expanding, and thousands upon thousands of pioneers rushed to fill it. At the same time thousands upon thousands of immigrants streamed here from Europe. And these are related traditions. The man who defined the New Frontier is himself just three generations from immigrant stock.

So I suspect PETROLEUM TODAY has commissioned this article on David Philip Levine not because his situation is novel, but because it is in this sense typical and meaningful.

Success in a strange land

Here is a man born in Lithuania more than 70 years ago, who started to study for the rabbinate at the Ponowiz Yeshiva when the pogroms against the Jews washed over Russia and spilled against his life. Like so many others, he left his homeland and sought a new life in what my mother always called *Die Goldene Medina* (The Golden Land). These people detested conditions they found in the old country: The class and economic distinctions, the narrowing of ambition, the restrictions against free speech and religion; and because they hated these conditions they struck out for themselves in a strange land to face unnamed dangers. And they succeeded, in spite of the fact that few spoke the language and even fewer understood the customs, succeeded for two reasons. One, they themselves were courageous and wanted more than those who stayed at home. Two, the native Americans helped them by the creation of the free public school system, which turned an immigrant class into a citizen class and did it within one generation.

This was the mobile society, and you knew it because for a dime you could take the Fifth Avenue bus and go wherever it took you with no questions asked. There were no limits to what you could do or where you could go—save your own character and talent and ambition.

There were peddlers who sold produce from pushcarts and became lawyers, fathers who lugged a bag of coal up five flights of tenement steps to earn enough to send their daughters to normal school. This was a country that let men change from a 15th- to a 20th-century environment within a single lifetime. It is no idle metaphor to say America is a country on wheels.

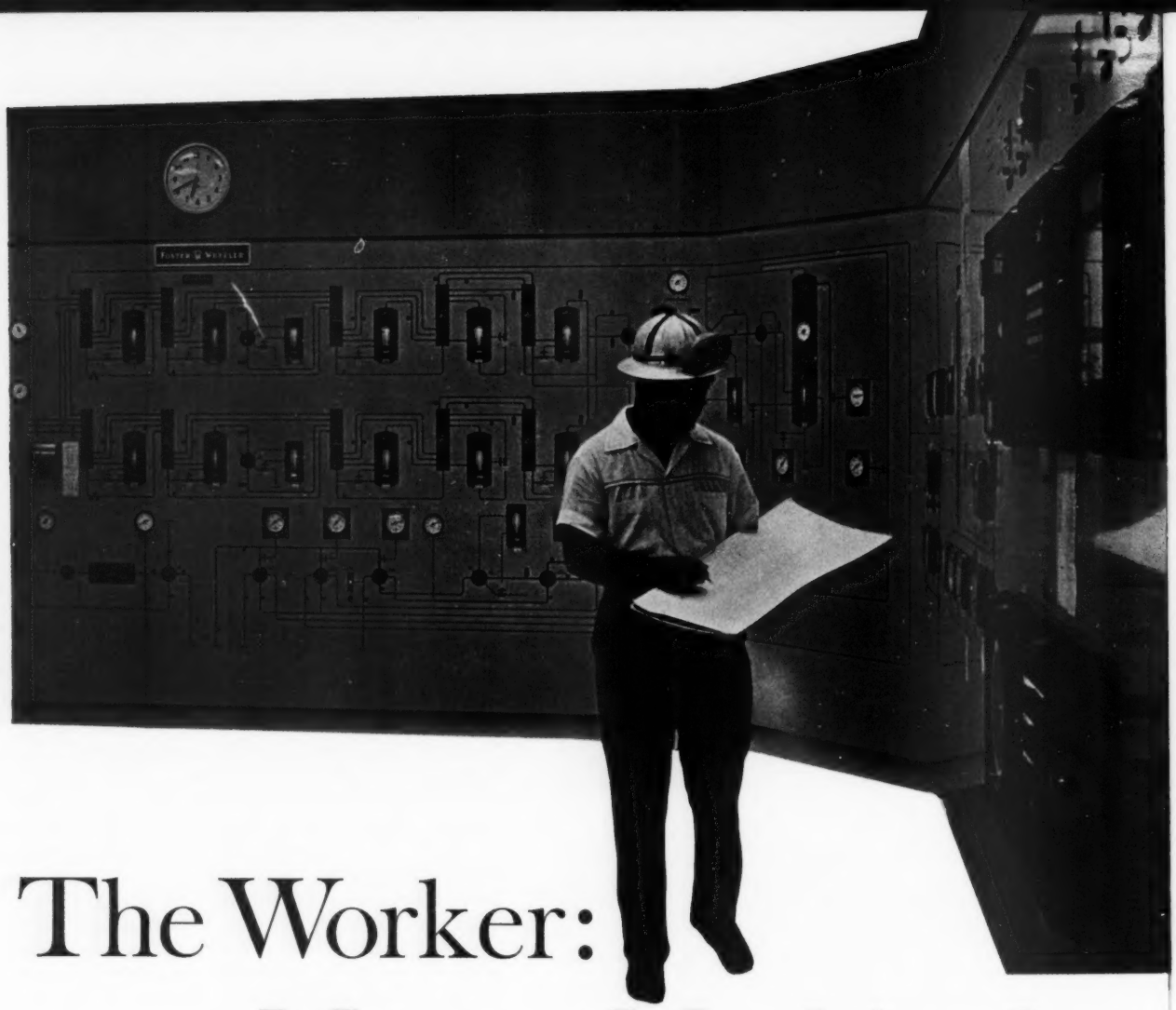
David Levine, the Lithuanian student who came here, knew no English. He surrendered his hopes for a life in religious office and got a job in the budding automotive industry. But it was a far more open society than he suspected. The country had room for him as a citizen, the industry had room for his labors, and the honor of being a religious leader was not denied him.

In Macon the Jewish congregation had a place for David Levine, the young man who had never been able to finish his studies for the rabbinate. He could be the cantor. Much of the Jewish religious service is sung, and a cantor, besides his healthy lungs, needs a fairly comprehensive knowledge of religious law and ritual. Mr. Levine met all these requirements.

And while he served the synagogue, he did such work as recapping tires. Then he had a chance to buy some property where there were two service stations. One he now leases, and the other he operates himself.

In their arrangement with David Levine, his congregations affirm the old Jewish idea that the most noble of all activities is *parnossoh*, making a living. A man who earns his livelihood honestly and makes a good home for his family has favor in the eyes of God.

Over the past few decades this idea both among Jews and other Americans has become somewhat muted with the chase of prestige. The older generation did not pay as much attention as the younger one does to social status. It believed, and I believe it is still right, that the highest status to which a man can attain is to earn an honest living for his family. Nothing ever gives him a greater reward.



The Worker: Man or Machine?

by Robert Blauner

IN FILMS such as Chaplin's *Modern Times* and René Clair's *A Nous La Liberté,* in serious intellectual discussions as well as in cartoons, the factory worker of today is portrayed as a man at the mercy of an assembly line. He is shown usually in a single monotonous pose, such as tightening a nut on a bolt—over and over and over again.

Does this depressing image represent the condition of the blue-collar worker in American industry? The conclusions I reached in a recent study for the Fund for the Republic indicate that the situation is considerably more complex than this commonly accepted stereotype of the worker would indicate.

How has this stereotype come about? Interestingly enough, industrial sociologists, academic specialists who make scientific investigations of conditions in work and industry, have helped to create it by concentrating their studies of manual workers on a few industries. In an industry-by-industry account of studies of work and workers by sociologists, I found that the six most researched manufacturing industries include only 43 percent of manufacturing employment. Yet these six make up 78 percent of the studies.

ROBERT BLAUNER, *an associate professor of sociology at San Francisco State College, has gained firsthand industrial experience as a factory production worker.*

A sociologist calls for a fresh look at the stereotyped image of the American blue-collar worker. He emphasizes the differences among industries.

Considering the current interest in automation and its importance for the future, it is remarkable that there have been so few sociological studies of the "continuous process" industries. (A continuous process industry is one whose product moves in a continuous flow while undergoing physical or chemical changes through automatic control equipment; oil refining, for example.) Perhaps the "social problem" heritage of sociology and the ideological interests of many of its students continue to be important factors. In any event, it can be said that American industrial sociology has paid insufficient attention to the differences among industries. These differences have important consequences for the worker.

Two kinds of technology

Assembly line and continuous process industries both are highly mechanized and highly organized forms of production. However, a basically different kind of technology has developed in these two types of industries because of the different types of products and raw materials. Automobiles, for example, are solid objects that consist of thousands of separate parts that must be attached mechanically to the chassis and body. Technological advances in assembly line industries resulted in the subdivision of the work into hundreds or thousands of individual jobs, and the organization of these jobs into a logical sequence. The jobs are performed on the product-in-process, which often moves past the worker on a conveyor device.

The products of oil refineries and chemical plants, however, are liquids and gases that have been submitted to a number of chemical operations. Here the transformation of raw material into finished product is chemical rather than mechanical. The oils and chemicals flow through pipes from one series of operations to another. The blue-collar employees do not work directly on the product but only manipulate the controls of the automated chemical reactor machines. The workers rarely even see the product.

As technology advances in the continuous process industries, two major changes take place in the make-up of the work force. Fewer production employees are needed on the same operation because automatic processes do more of the work, and considerably more men in various skilled trades are required to maintain and repair the expensive and complicated automatic machinery. (In large oil refineries maintenance workers may actually outnumber process or production workers.)

What does all this mean to the worker in terms of job satisfaction? Case studies state that jobs in assembly line industries are often characterized by low skill, repetitiveness, monotony, and an especially frustrating lack of control over the pace and process of production; but there is little published material on the nature of work and the extent of job satisfaction in continuous process industries. One might expect that the process operator who watches panel boards and adjusts dials may feel himself a small, ineffective creature before the colossus of technological arrangements. He even seems to lack the direct contact with his product that gives the men on the assembly line some satisfaction.

But there is a major difference between these two types of industries. Much of the work in continuous process plants requires a large amount of responsibility. What is especially important, the worker's span of operations encompasses a much larger part of the productive process. In contrast to the assembly line worker, who is generally restricted to one work station and whose job may be no more than to bolt on a single part, the employee in a refinery or a chemical plant often works over a large area; he must understand an entire process and know where his own task fits into the big picture.

An influence on job satisfaction

Such differences in the nature of manual work appear to have a very real influence on overall job satisfaction. A survey of 3,000 factory workers in 16 different industries indicates that while many workers in the assembly line industries feel that their jobs make them work too fast, relatively few in the continuous process industries have this complaint. In each of the continuous process industries studied, the proportion of workers who feel that their jobs are interesting and allow them to try their own ideas is higher than in any of the assembly line industries.

Industrial work environments differ greatly, not only with respect to job requirements but also in terms of the workers' chances for personal security and development. There are large differences in job

stability, advancement opportunities, and long-term security between the continuous process and assembly line industries; thus the nature of the employment relationship is basically different. In assembly line industries many workers do not work a full year. In the continuous process industries employment is relatively stable. For example, in an average month during 1958 a worker in one of the larger assembly line industries was 18 times likelier to be laid off than was an oil refinery employee.

In assembly line industries the vast majority of workers are in semiskilled (actually unskilled) jobs, and the number of skilled or supervisory posts open to production workers is very few. Thus, as sociologist Ely Chinoy has shown, "advancement" comes to mean getting off the line, earning higher pay in the same position, and improving one's level of living off the job.

Skill mix is balanced

The situation is quite different in the continuous process industries. They are characterized by a "balanced" skill mix; there are large numbers in unskilled, semiskilled, and skilled work. Within both the production and maintenance functions there are definite career patterns or advancement routes for the new employee. He is hired as a laborer or helper; and he moves up in pay, status, and skill—first to a job as a semiskilled operative or maintenance worker and later to that of a skilled journeyman or chief operator of a processing machine. (At one of the nation's largest refineries several years ago 90 percent of the more than 1,000 skilled workers had originally started in the plant as unskilled laborers.)

Workers in continuous process industries are much likelier to feel that their job leads to a promotion and are more optimistic about their chances of reaching and surpassing the foreman level.

A worker's industrial environment greatly affects not only how he feels about his present position but also whether he views the distant future with foreboding or with hope. The petroleum industry (and to a lesser extent the other continuous process industries) has an array of employee benefits that includes paid sick leave, company contributory savings plans, pensions, and death benefits. In 1959 a survey of the National Industrial Conference Board found that almost 40 percent of all the company savings plans in the country were in the oil industry. In 1957 this industry averaged 78 cents per payroll hour for fringe benefits, compared to only 45 cents for all manufacturing.

In the continuous process industries a number of factors have combined to make manual employment much like a career rather than an essentially temporary arrangement based solely on wages. First, because of the economic health and long-term progress of continuous process industries, work tends to be permanent: there is much less possibility of either temporary or permanent layoffs. Second, the workers are highly paid and receive significant fringe benefits. Third, continuous process industries require manual workers at various levels of skill and responsibility (in contrast to the predominantly low skill requirements in assembly line industries). Definite channels of advancement have become institutionalized.

Since the continuous process industries require workers at all skill levels, the manual workers in these industries enjoy a highly stratified, differentiated society with considerable upward mobility possible within the industry. In contrast, the blue-collar worker in the assembly line industries works in a "mass society" with little difference between workers and almost no internal advancement possible. The wage spread within a company is another index of differentiation. In continuous process industries this spread is considerably wider than in assembly line industries. For example, in 1958, among manual workers comprising the middle half of the wage scale in oil refineries, the lowest wage rate differed from the highest by 70 cents. For the same middle half among workers in a major assembly line industry, the difference was 14 cents.

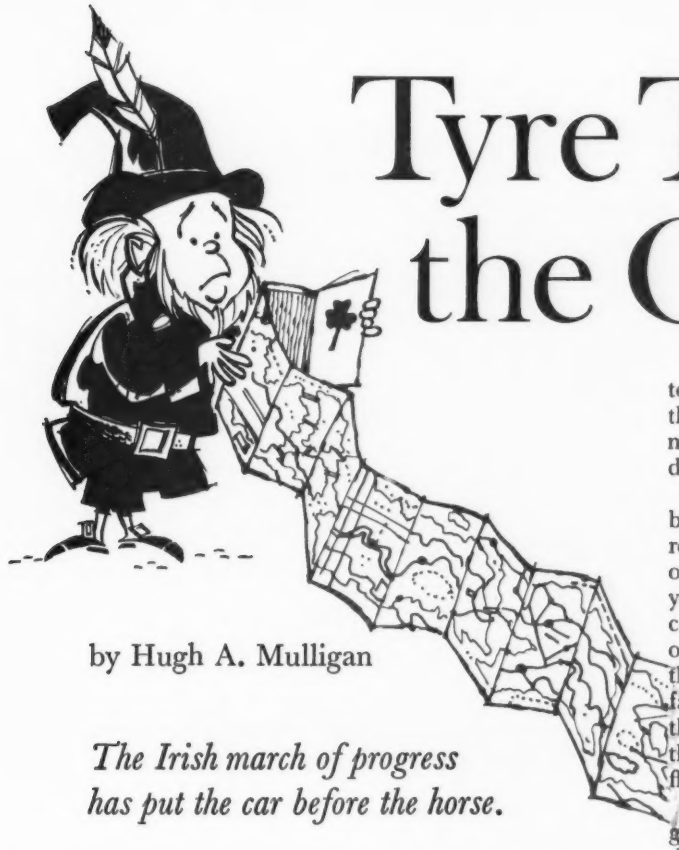
If we view the manual worker and his industry as comprising a distinct social system, we should expect that a highly differentiated industry with social mobility ladders would provide much greater incentive for the worker to achieve and develop loyalty to the company and industry than would an undifferentiated industry. And our analysis suggests increasing similarities between the situation of manual workers in continuous process industries and that of white-collar employees in general.

What does all this mean in terms of the stereotyped image of the worker in an industrial society?

Generalizations are suspect

Certainly I feel that this study points up the fact that sweeping generalizations about the state of the worker are liable to sweeping errors. The image of the dehumanized worker cannot be said to be valid for the continuous process employees I have discussed. Whether the superior working conditions in the oil and chemical industries are due to their advanced technology or to their dynamic growth and success is a point that can be debated; the fact of the superior working conditions, as compared to the assembly line industries, is incontrovertible.

And this leads to a more general conclusion about our attitudes toward the condition of the industrial worker. I would suggest that henceforward any picture we may have of the worker should be re-examined in terms of the great variations in his real working situation.



Tyre Tracks in the Ould Sod

by Hugh A. Mulligan

The Irish march of progress has put the car before the horse.

IF YOU EVER go across the sea to Ireland, don't expect to be met at the dock by a Barry Fitzgerald type in peaked cap and turtleneck sweater enthroned on the jump seat of a jaunting car.

Barry Fitzgerald types are still in common supply among the populace, and so are peaked caps and turtleneck sweaters; but the jaunting car is quickly giving way to the more practical if less picturesque automobile.

In a country where up until only a few years ago the dog and donkey vied with the horse as the most popular modes of transportation, the motor age has dawned belatedly but spectacularly.

In 1945 there were fewer than 8,000 private cars licensed in Ireland. Today there are nearly 170,000, and half the populace is either in the process of learning how to drive or on the verge of giving it up as a bad job. Or at least so it seems.

Ireland's mastery of the motor vehicle has come about in a typically Irish manner—that is, with a minimum of red tape and a maximum of devil-may-care enthusiasm. The country is gloriously lacking in parking meters, radar devices, traffic courts, and many of the other legal unpleasantries that are so commonplace in stuffier climes.

The Irish have taken a somewhat neutral stand on the question of which side of the road is the best to drive on. The British, as everyone knows, drive on the left side of the road, while we Americans and most Europeans drive on the right. The Irish, to be different, drive up the middle of the road.

Nominally, the law calls for driving on the left, but every Irish motorist knows that the left lane is reserved for sheep and bicycles and parish priests out for a stroll. The standard procedure, whether you're driving a one-lung scooter or a massive cement lorry, is to straddle the stripe in the middle of the road until something bears down on you from the opposite direction. Then you scoot to the left as fast as you can, hug the ditches and fence posts in the absence of a road shoulder, and finally return to the middle of the road when the obstacle has finally fled by.

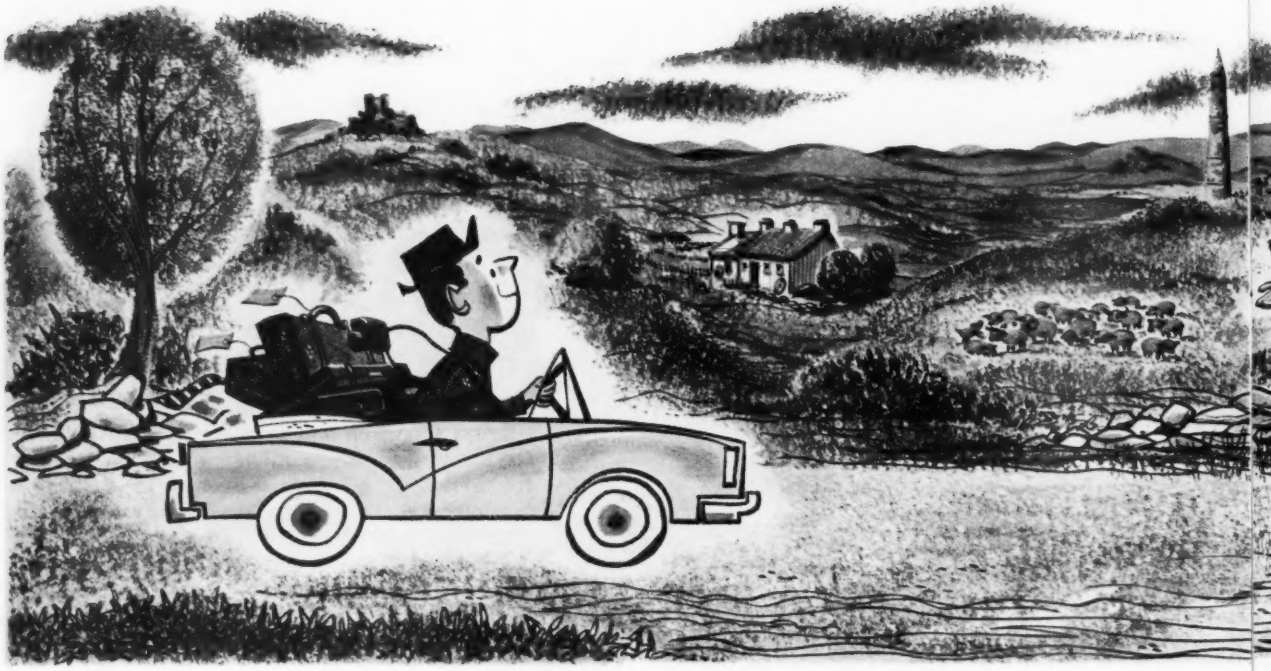
On hills and hairpin curves this quaint custom gives motoring in Ireland a spirit of adventure seldom found in other lands. It also does wonders to prevent a population explosion in the sheep industry.

Legend has it that the Irish Republic, made up of the 26 counties that won their independence from Great Britain, once flirted with the idea of driving American style on the right-hand side of the road. The only trouble was that no one could figure out what would happen when traffic converged at the borders of Northern Ireland, which is still British ruled and unswervingly dedicated to driving on the left.

Americans would seem to be much admired in Ireland. Certainly the Irish motoring industry is bent on bringing itself up to American standards. Service stations, for instance, pride themselves on offering such American-style conveniences as clean restrooms, up-to-the-minute lubrication equipment, automatic car-washing facilities, prompt and courteous service with all the trimmings: road maps, windshield wash, tire check, under-the-hood inspection, etc.

Occasionally, however, their reach exceeds their grasp.

On a recent trip to Ireland I pulled into a service station in a remote section of County Mayo and was shown about the premises by the proud owner. He was anxious to get my opinion of his brand-new pumps, his fluorescent signboard, his U. S.-brand



oil products arrayed smartly in a display case, his hydraulic pit lift. Inside the station, which was as neat as a pin, he proudly pointed to a huge sign over a freshly painted door. The sign didn't say "Men" or "Gents," for the Irish are a very formal people. It said, quite grandly, "GENTLEMEN." I threw open the door with what I thought was a flourish worthy of the occasion and found myself in a field, surrounded by sheep and goats.

His restroom may have lacked some of the modern conveniences, but the rest of his facilities were a good deal more advanced than some of the other stations, in even more remote areas, where the pumps are still cranked by hand and the pumping is done by the lady of the house.

A friend of mine on a recent tour of Ireland had a similar collision with the Irish march of progress. He found himself in a large city—Galway, I believe—late at night with a broken fuel pump. With mounting desperation, he hunted about for more than an hour in quest of a garage that might still be open. The streets were deserted. Finally, he encountered a policeman who asked if he might be of service.

"Yes," said my friend. "Do you know if they have any all-night garages in this town?"

"Ah, indeed they do," replied the constable. "Several of them as a matter of fact. But you'll not find them open at this hour!"

Irish roads, in general, are paved, well maintained, and relatively straight; but the curves that do exist are whoppers, having been engineered for horses and not for hot rodders. Gasoline—or petrol as both the British and the Irish call it—is relatively expensive: as high as 59 cents a gallon. Service stations are somewhat few and far between, but not nearly so few as they used to be, and many familiar U. S. brands are available. The American petroleum industry has invested heavily in the new oil refinery at Cork, the only one in Ireland and one of the most up to date in Europe.

What few really rigid laws Ireland has adopted over the years out of sympathy for her barristers and constables (who otherwise would be on the dole) are frequently waived in favor of the visiting motorist.

Take the matter of drinking, for instance.

Contrary to what you might have heard elsewhere (in an English publication perhaps), the Irish are a most abstemious race. Their legalized drinking hours would make a Spaniard weep and a Frenchman revolt. Pubs open for business most days at 10 a.m. and shut down promptly at 10:30 p.m., barring a local emergency like a wake or a football riot.

Even so, a country that has known the pangs of a great famine prides itself on having few recorded instances of death from thirst. Ireland, after all, isn't the Sahara and has no ambition along that line. The

potato crop may have failed a few times, but nothing has ever kept the smoke from fluming out of the stacks of the breweries and distilleries along the River Liffey.

Irish drinking laws have a hospitality clause that permits travelers to drink at any hour of the day or night, so long as they have strength enough to raise the innkeeper from his slumbers. All local patrons are supposed to cease imbibing at the appointed hour, leaving the field clear for bona fide travelers. But the Irish, being a gregarious people, would never allow a man to drink alone, particularly at odd hours of the night when he might get himself into trouble (pronounced "throuble") or might die of loneliness for want of a bit of conversation.

For this very humanitarian reason, if for no other, the itinerant motorist is welcomed with open spigots at every crossroads tavern and inn, and his very arrival occasions a great outpouring of the local citizenry. The hospitality clause, when invoked in full, usually results in an after-hours singsong, a darling Irish custom that requires everyone in the house, regardless of condition of voice or condition of self, to get up and sing a song when his turn comes. As the night wears on, the songs become more exuberant and the songsters more sodden. Ireland was famous for its Saturday night fights long before television was invented.

Historic ruins abound in Ireland. Every few miles the motorist encounters centuries-old round towers, Celtic crosses, or the ruins of abbeys and monasteries and castles that date back to the days of the Danes and the fearless warrior Brian Boru.

"If it's ruins you want, we've got a feast of them," I was told by an old crone sucking her pipe outside the gates of the Rock of Cashel, Ireland's world-famous ecclesiastical remains. "Sure, I'm an old ruin meself."

Several years ago I was in a group of American journalists who made a bus tour up the east coast of Ireland. The bus stopped at the top of a bleak mountain where an old shepherd was tending his flocks among the granite ruins of what once must have been a very impressive monastery.

"The sheep don't have much to eat up here, do they?" one of the group asked solicitously.

"No," admitted the shepherd. "That they don't. Sure, but they have a grand view."

Another thing that enlivens driving in Ireland is that while most of the roads are well marked, they are not always marked in a language understandable to the driver. Or even to the natives, for that matter.

For the past 30 years the government has been trying, with increasing success, to reintroduce Gaelic, or Irish, as the national language. The idea is not to do away with English, which is spoken almost everywhere, but to give Ireland and its people a stronger cultural link with the past.

To help this "second language" along, many town and city names have been changed back to their old Gaelic names on maps and road signs. Thus, Kells is now listed as Ceannus Mor, and Navan as An Uaimh; and while the inhabitants of both have dutifully memorized the new old name, they frequently cannot tell you the name of the next town to which you are heading.

As one who has driven about Ireland a great deal, I have spent many pleasant hours in roadside conversations that began with instructions like, "Take a left at the next village—now what's the new name they have on it?"

What usually follows is a long and learned historical chat, full of great legends and sparkling anecdotes, growing in richness and flavor as new authorities give their opinions, but seldom leading to any authoritative conclusions.

"What would you be doing there anyway?" is the way the matter is usually resolved. "Sure it's a poor place at best, and you'd be better off staying right here where the trout fairly leap at your line and the food and drink at the inn would make your mouth water."

In Ireland the jaunting car may have given way to the automobile, but the relaxed pace of the country hasn't quickened all that much.

and they call her SHANGRI-LA

Shangri-La. Its forsaken courts and pale pavilions shimmered in repose from which all the fret of existence had ebbed away, leaving a hush as if moments hardly dared to pass.

—James Hilton in *Lost Horizon*

A ROAR LIKE the hammers of hell rises from the deck of the giant carrier. Windows rattle; steel bulkheads shake. Hundreds of men stand at the ready as the first jet prepares to leap into the sky.

This is the U.S.S. *Shangri-La,* a hundred million dollars' worth of fighting ship with the unlikeliest name in the fleet.

Spring 1942. Jimmy Doolittle had just led the first air attack against Japan, and reporters were pressing President Roosevelt to identify the base from which the attack had been made. But FDR wasn't talking. The most he'd say, with a whimsical grin, was, "Shangri-La."

Actually the base had been a Navy carrier, the U.S.S. *Hornet.* Two years later, when a new carrier was being launched to replace the *Hornet* (which had been sunk by enemy action), FDR's reply was remembered. The new carrier went down the ways as the U.S.S. *Shangri-La.*

The ship became a "landmark" in the history of naval aviation. She was the first carrier to have a canted flight deck and modern steam catapults. In the Pacific she demonstrated the awesome capabilities of sea-based aircraft. (Bombing raids from her flight deck against the Japanese mainland became so frequent that she earned the nickname "Tokyo Express.") After the war she was the first carrier equipped with jet plane arresting gear.

Thus the *Shangri-La* is an appropriate symbol of the 50-year span of our Navy's air arm. She stands midway along the path from Naval Aviator No. 1, Lieutenant T. G. Ellyson, and his primitive biplane, to Commander Alan Shepard, Jr., and his space rocket.

While the Shang's jets slice the sky overhead, tension hovers within the ship's Combat Information Center. Intelligence data are correlated here and commands radioed to the jet pilots.

A naval airman is a special guest aboard the "Shang." The carrier is there to accommodate him and his Mach 2 aircraft.

The decision as to whether he flies rests in the hands of Captain Herbert N. Houck, a naval aviator for more than 24 years and a highly decorated combat leader of World War II and the Korean War. When that decision is made, some 3,000 men and masses of complex equipment are set in motion within seconds.

Massive superstructure of the U.S.S. Shangri-La rises stark against the Caribbean sky. A destroyer, one of two assigned to escort the carrier, is about to be refueled from the Shang's oil supplies.

Aircraft begin rising from the hangar deck just below the flight deck. Control of the mission is switched to Primary Flight Control ("Pri Fly" in Navy lingo), where the air officer determines what planes to launch and controls the operation. Information he might need is written on plexiglass screens for his possible use; four "talkers," men who are connected by open-circuit telephone to every vital point in the ship, relay his messages. When he posts the "red flag," the catapult officers start moving the aircraft toward the "cats."

As the aircraft taxi across the flight deck, the flight deck officer takes over. The pilots watch him closely as he directs them toward one of the carrier's catapults.

The Shang turns into the wind to launch. She moves along at 25 knots, the wind screaming over the deck. The cat crew signals for takeoff power, and it comes with a roar; without special helmets, the crew would be deaf within a few hours.

"White flag!" The steam-operated catapult shoots plane and pilot from 0 to 110 miles per hour in less than 230 feet.

The instant the plane clears the deck, the cat crew moves into action to make equipment ready for the next launch. They work as many as 18 hours a day.

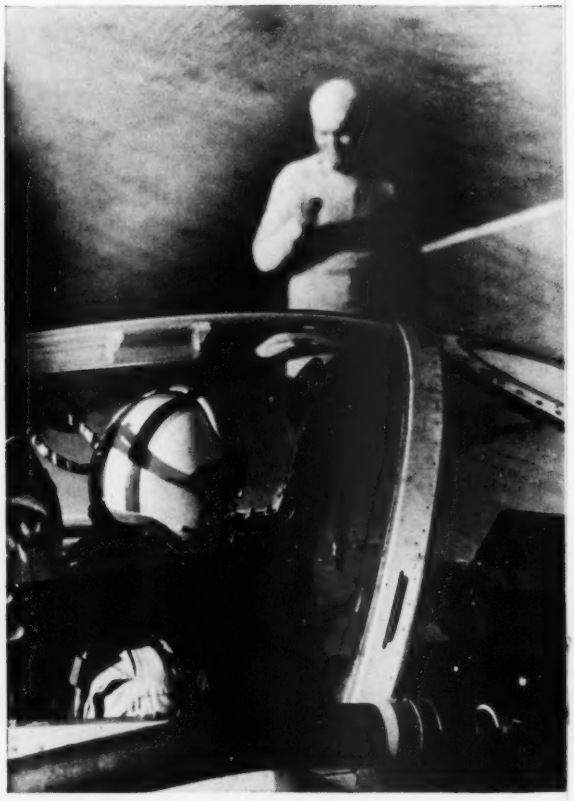
While the takeoffs continue with clocklike regularity from the bow, planes returning from earlier missions are landing at the stern. An F8U Crusader, for example, 14 tons of airplane, hurtles toward the deck at more than 150 miles per hour. In order to land, it must catch one of four arresting cables stretched across the deck; if it fails to catch, the pilot has just a fraction of a second to add power and get back into the air—otherwise he goes into the water.

On an average operating day the Shang recovers and launches as many flights as a commercial airfield near a large city. She has all the accouterments of a modern airdrome: Repair shops, spare parts stores, maintenance men. She also has another necessity of flight—fuel. She carries more than 1 million gallons of aviation fuel, consumes as many as 70,000 gallons a day. Most of her aircraft are jet powered.

The dimensions of the ship are impressive. Fully loaded, she displaces 43,000 tons. She is more than 100 feet wide at the waterline—too wide for the Panama Canal. Her flight deck is 860 feet long; and the distance between her waterline and her highest point, the Navy carefully reports, is 194 feet 11 inches.

She's a big ship, the Shang; and at times a roaring, blasting, bellicose ship. One thing she's not is a peaceful haven away from the world's storm and strife. One thing she's not is a Shangri-La.

Below decks the jets are fueled for action. The Shang carries more than 1 million gallons of aviation fuel; her planes may consume as many as 70,000 gallons a day.



Pilot awaits signal from launch officer. His plane is the A4D, which flies at better than 600 miles per hour and can carry nuclear weapons.

In the ready room the pilots wait; they read, drink coffee, try to relax. At any moment the loudspeaker may split the quiet: "Pilots, man your planes."

Crewmen of the Shang stand ready for call to action. They wear special sound-deadening headgear.

The jet's engine roars, the signal to launch is given, and the plane screams across the deck. The instant the jet clears the deck, the catapult crew moves in to prepare for the next launch.

The Father of the Gasoline Tax

by Don Holm

A NEWSPAPERMAN IS likely to be concerned with the present and the future; the past is generally outside his primary area of interest. Recently, though, I had occasion to enter that unaccustomed sphere. My companion was a man named Loyal M. Graham, and the trip backward in time spanned a full century.

My visit with Loyal Graham was the last interview he granted the press. He died this summer, rich in years and in accomplishments. He was a man to be remembered, not only for what he achieved, but for what he was.

Graham spent his last years at the Masonic and Eastern Star Home in Forest Grove, Oregon. When I interviewed him, he was 100 years old—a slightly built man with a deep voice and a warm, friendly manner. Despite his age, he rose early, had frequent visitors, smoked three or four cigars a day.

Back in 1919 Graham was a member of the Oregon House of Representatives from Washington County, already a veteran lawyer and political campaigner. It was in that year that he earned the title that was to gain him national attention: "The Father of the Gasoline Tax."

Representative W. B. Dennis, of Carlton in Yamhill County, was a close friend of Graham's and was at that time the chairman of the Roads and Highway Committee. Often, between sessions of the Legislative Assembly, Dennis would drive over to Graham's home in Forest Grove, where the two men would exchange complaints about the condition of Oregon's roads and the recent unsuccessful attempts to finance highway construction.

One thing led to another, and the idea of putting a tax on gasoline to improve the roads was born.

At the beginning of the 1919 session Dennis spoke to the House on the subject. "No one seemed to object to the idea," Graham said, "because it didn't affect that many people."

Dennis then introduced a pilot bill. But when the details became known, the secretary of state objected violently. "He told me it would cost more to collect the tax than it would bring in," Graham recalled. "But we didn't figure it that way, and we were right." Because the brunt of the collection burden is borne by the oil industry, the cost of collection to the state is less than 1 percent of the income.

Graham chuckled as he told me the rest of the story. "Dennis withdrew the bill and tossed it at me.

DON HOLM *is a member of the editorial staff of the Portland* Oregonian.

'Here's the damn thing,' he said. 'Take it and do what you want with it.' So I stepped into the speaker's office and drafted a new bill right on the spot and introduced it again. It passed almost unopposed, and we had a one-cent gas tax."

However, it didn't remain at that level for long. The Oregon Legislative Assembly raised the tax to two cents a gallon in 1921. It went up a cent in 1923, again in 1930, again in 1933. It reached its current level of six cents a gallon in 1949.

By 1923 Graham had begun to be concerned about the direction his tax idea was taking. "When it went to three cents," he said, "I got scared. When it reached five cents, I knew the damn thing couldn't be stopped. I went down to Salem and fought it hard, but it was no use."

Within weeks after the passage of the original law, Graham remembered, mail began pouring in from legislators in other states asking for details on this new source of income. "You'd have thought we'd found the goose that laid the golden egg," he said.

Within 10 years every state in the nation had a gasoline tax law on its books, and in 1932 the Federal Government followed suit. The income from the various taxes on gasoline has today reached impressive proportions.

In 1960 the Federal four-cent levy on motor fuel brought in $2.3 billion; the amount collected in motor fuel taxes by all the states for that year approached $3.4 billion. And Oregon's six-cent gasoline tax produced almost $37 million in revenue. In Oregon Federal and state gas taxes combined now equal approximately 40 percent of the retail price.

Graham had a nice way of summing up the history of his tax innovation. "It accomplished its purpose at the time," he said, "but it began to grow and grow." Then he leaned back and puffed philosophically on his long cigar. "It's a tendency of the Yankee to ride a free horse to death," he observed.

Graham did not consider his role as "father" of the gasoline tax to be the most important achievement of his career. He had a proper pride in the other aspects of his long and full life of public service.

As a young man, Graham left his native Pennsylvania and moved westward, settling in Nebraska. There he began to practice law and was elected to the State House of Representatives. (Nebraska did not adopt the unicameral form for its legislature until 1934.) In 1911 he again migrated westward, to Forest Grove, and he soon became a leader in civic affairs and politics.

While in the Oregon House, Graham wrote the state's first legislation creating union (consolidated) high school districts. Another achievement was the promotion of an all-weather highway across the Coast Range to Tillamook on the ocean. Completed in 1941, it is now Oregon Highway 6. Near its summit a modern bridge spanning Devil's Fork of the Wilson River bears the name of Loyal M. Graham.

Graham moved from Forest Grove after the death of his first wife; he married the present Mrs. Graham in 1945, and they lived in Taft, on the Oregon coast. Three years ago Graham took his room at the Masonic Home, where he could receive the medical care his advanced years demanded. His wife moved in with members of her family nearby.

He had four surviving children, all of whom live in Oregon. Warren T. is a graduate architect and city engineer in Forest Grove; he lives in a house built by his father in 1913. Edwin L. is a prominent Portland attorney. Leone recently retired after teaching 34 years at the same Forest Grove school. Maude is a schoolteacher in Oregon City.

Graham spent most of the day rocking in his chair and looking out his second-floor window over the Oregon countryside. He liked to catnap between visitors. His wife came over every day, and he had many friends who stopped by.

Graham regularly attended lodge meetings in the home. He considered the institution one of his finest achievements. He helped to found it in 1919. "We hired a good architect and a master corps of bricklayers from our own membership," he said. "You won't find a building in the state, even today, as well constructed."

On his 100th birthday, November 20, 1960, Graham received 260 letters and telegrams from well-wishers, including President and Mrs. Eisenhower, Governor Mark O. Hatfield, and President-elect John F. Kennedy. A lifelong Republican, Graham hadn't made up his mind about the new President: "I can't read any more; so I haven't been able to get much information about him."

Graham was more comfortable with thoughts of the days gone by. He recalled, for example, that he was already middle-aged when the auto became part of the national scene; he could remember the days of the covered wagon as though they were yesterday. And he liked to recount his part in making today's "wonderful highway system" possible.

"I've never been sorry I wrote that gasoline tax bill," he said. "It helped put the country on wheels, probably more than any one law." Then he paused. "But they pushed it too far for my taste."

THE FLAMING ELEMENT

Hydrogen is one of the most familiar of substances, but it may be the key to man's conquest of the stars.

by Isaac Asimov

FROM THE moment of its discovery, hydrogen has had a revolutionary effect upon mankind. It has broken down old theories and helped establish new ones. On two occasions it has led man upward toward the stars. Now it points onward toward endless energy stores for man's future needs.

Its history began in flames. In 1766 the English chemist Henry Cavendish produced a new "air" from iron and acid. It exploded when heated, and Cavendish called it "inflammable air." He also showed that when inflammable air burned, water was formed. Then Antoine Lavoisier, founder of modern chemistry, demonstrated that inflammable air was itself a chemical element.

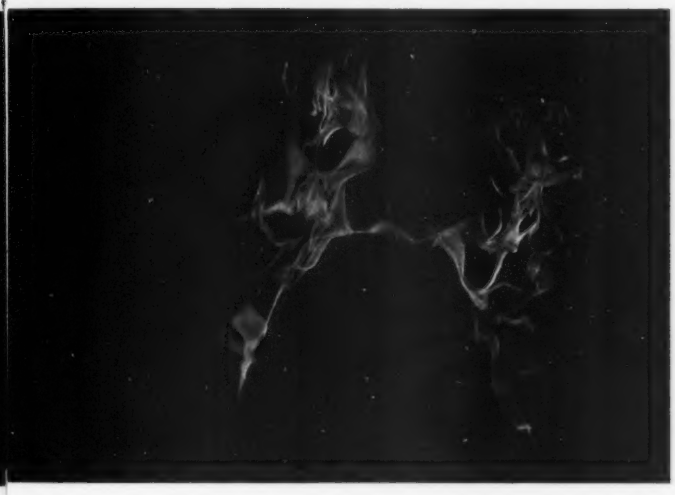
The world of chemistry was astounded. For thousands of years it had been believed that water was an element, that it could not be formed from simpler materials. Now it was shown that the combination of two gases produced water. Lavoisier gave inflammable air a new name, "hydrogen," from the Greek for "water producer."

Hydrogen was a wonder gas in another way: it was incredibly light. (A cubic foot of ordinary air weighs an ounce and a quarter; a cubic foot of hydrogen, a tenth of an ounce.) All over Europe and America in the first years of the 19th century hydrogen-filled balloons were drifting across the heavens. For some the balloons were merely a source of thrills, an exciting adventure. For scientists they represented a new way of studying the heights of the air—the first step toward the stars.

ISAAC ASIMOV, *who has written extensively on scientific subjects, is an associate professor of biochemistry at the Boston University School of Medicine.*

A new era of aerial transportation seemed on the horizon when the German inventor Ferdinand Count von Zeppelin sent his propeller-driven, hydrogen-filled namesakes into the air. But hydrogen, for evil as well as for good, is a creature of flame; and the fiery destruction of the *Hindenburg* in 1937 provided a dramatic quietus to dreams of fleets of commercial dirigibles.

Meanwhile, heavier-than-air machines were being developed that were faster and more durable than any balloon could be. It began to look as though hydrogen might be confined to such earthbound applications as the oxyhydrogen torches used to cut steel.



But it was not to be. If the dirigible went *down* in flames, the rocket went *up* in flames.

The height to which a rocket will rise depends on the upward thrust given it by its exhaust gases. As Isaac Newton would put it, the more violent the action (the downward jet of the exhaust), the more violent the reaction (the upward movement of the rocket).

Early rocketeers of the 19th century used gunpowder, which contains an oxygen-rich compound called saltpeter. It also contains carbon and sulfur, which, when heated, combine violently with the oxygen in saltpeter. Gunpowder is thus fuel and oxygen combined. But gunpowder is not very powerful. In 1926 the American physicist Dr. Robert H. Goddard tried another kind of rocket fuel with far greater success. On March 16 of that year, at his Aunt Effie's farm at Auburn, Massachusetts, he launched the world's first liquid-propellant rocket. His fuel, a mixture of gasoline and liquid oxygen, yielded about five times as much energy pound for pound as TNT. (Although Goddard fathered the modern rocket, it came of age under the Germans, who built the V-2 rockets during World War II.)

The gasoline-oxygen combination was effective, but the search for more powerful sources of rocket energy continued. Researchers found that of all chemical fuels, hydrogen (combined with oxygen or fluorine) flamed most energetically.

Once again hydrogen seemed to be on the brink of an aerial career, but there was a catch. Hydrogen couldn't be used in its ordinary form. A pound of hydrogen takes up 160 cubic feet of space, and the one thing a rocket lacks is roominess.

The gas had to be obtained in compact form; the answer seemed to be to cool it into a liquid. The rocketeers called for liquid hydrogen, and the call became more urgent after World War II as the dread A-bomb began to be superseded by the H-bomb. The wonder gas was suddenly in great demand, as a liquid.

While some scientists were finding uses for hydrogen, others were devoting themselves to making the gas available in usable form and in sufficient quantity. Ironically enough, the job has been a formidable one.

The irony arises from the fact that hydrogen is a most common substance. Three-fifths of the atoms in living tissue, including your own body, are hydrogen. Two-thirds of the atoms in the ocean are hydrogen. But the process of separating hydrogen atoms from other atoms with which they are combined is a problem.

Shortly after World War II a group of oil companies and natural gas companies got together to try to set up a plant to make gasoline out of natural gas. They evolved a process of burning the natural gas and then quenching the flame at the proper point in order to make the burning incomplete and to produce carbon monoxide and hydrogen (rather than carbon dioxide and water). The process worked, but it proved uneconomic to produce gasoline in this manner in competition with the natural supplies of oil that were available after the war. However, the research had important ramifications. The new process proved to be far more efficient in the production of hydrogen than any of the older methods had been.

Thus when the mid-20th-century call went out, production could easily be expanded to meet the need for hydrogen itself. The need for liquid hydrogen was another matter.

All through the 19th century chemists had tried to liquefy gases. Some, such as chlorine and sulfur dioxide, had yielded readily with little cooling. But for gases like oxygen, nitrogen, and hydrogen, the temperature had to be very low indeed.

It wasn't until 1896 that the English chemist

James Dewar managed to obtain liquid hydrogen. It boils at −423°F., a temperature that is only 38 Fahrenheit degrees above absolute zero—the very bottom of the temperature scale.

Creating liquid hydrogen had been one problem; producing it in the quantities required after World War II proved to be another. The chief trouble was that this superfrigid liquid evaporated with superease: a complex molecular action within the liquid actually produced heat. And if the liquid hydrogen container wasn't properly vented, the pressure resulting from this evaporation process could build up to explosive levels.

FOR 50 YEARS after Dewar's achievement liquid hydrogen remained little more than an expensive laboratory curiosity. Then the urgency of the requirements brought a scientific breakthrough, a means of stabilizing liquid hydrogen using a substance known as a catalyst.

The scientists turned to the petroleum industry for a supply of stable hydrogen. Oilmen were familiar with catalysts, these substances that promote chemical changes in other materials without themselves changing. Catalysts are used in the petroleum refining process to obtain a high yield of gasoline from crude oil. It was the development of catalytic cracking that enabled the industry to meet the nation's demand for fuel when the automobile came of age.

The oilmen succeeded in turning out the quantities of "stable" hydrogen required. Where previously 1 percent of the hydrogen had been lost in an hour through evaporation, now 1 percent was lost only after three days. The price went down, and liquid hydrogen plants are now being built that will produce 20 tons and more a day.

The vastly increased production of liquid hydrogen is being put to immediate use, particularly for rocket and missile work. In particular, liquid hydrogen powers the giant rockets that may carry a man to the moon.

The other postwar reason for preparing quantities of liquid hydrogen in a hurry has vanished. To be sure, the first experimental hydrogen bombs did use liquid hydrogen, but they were not practical. The insulation needed made the bomb unwieldy. A hydrogen compound (lithium hydride), which is a solid at ordinary temperatures, is now used.

But there is another use for liquid hydrogen that is helping to solve some of the mysteries of the atomic make-up of our world. This is in the "bubble chambers" employed to track down the strange and short-lived subatomic particles produced by today's mighty atom-smashing machines.

What of hydrogen's future? One use for the wonder gas may lie in the production of electrical energy. Ordinarily, electricity is formed through a generator run by the heat energy of burning coal or oil (or, of course, by the energy of falling water). A great deal of energy is unavoidably lost in the passage from heat to electricity. If it were possible to combine fuel with oxygen in an electrical cell set-up (a so-called fuel cell), the process could be made much more efficient.

A number of fuels—including powdered carbon, carbon monoxide, and methane—have been tried in fuel cells. The practical difficulties involved in making such cells economic are great, however; one possibility that seems to hold promise is the hydrogen-oxygen fuel cell. Such cells have been made to work, on a small scale at least, and the time may not be far off when the hydrogen produced by the oil industry will make electricity cheaper and more available than ever before.

The most exciting prospect for hydrogen, however, is in another area. If somehow the hydrogen fusion that is so frightening in terms of the H-bomb could be brought under control, mankind's energy needs might be solved for the indefinite future.

What is needed is to raise the temperature of a quantity of hydrogen to the point where fusion will start and proceed slowly and steadily (instead of explosively). And this must be achieved without resorting to a fission bomb to start the fusion.

A RARE KIND of hydrogen particle known as "heavy hydrogen," or "deuterium," is thought to be a key to the problem. For deuterium fusion takes place at a temperature considerably under the temperature required to fuse ordinary hydrogen. Still, the temperature needed is in the hundreds of millions of degrees, and the problem of containing the fusion remains.

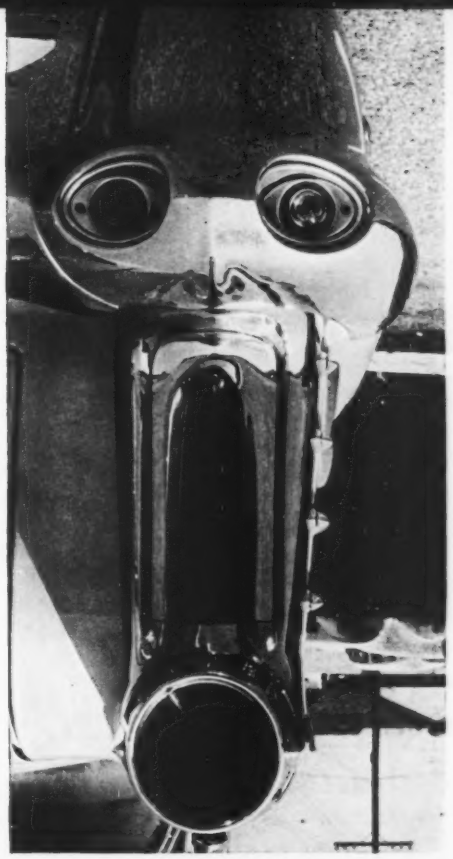
When deuterium atoms (and all other kinds as well) are raised to these temperatures, they break up into a mixture of charged subatomic fragments called plasma, so hot that it cannot be contained by anything made of matter. But since plasma is electrically charged, it can be confined by magnetic fields; and this is the approach scientists are taking. Each year the deuterium plasma is being raised to higher temperatures and is being confined for longer periods of time.

When fusion is tamed (and it may happen before the 20th century is over), a new kind of powerplant will spring up, a new kind of energy will be available. From oil and natural gas will come hydrogen, and from hydrogen will come deuterium. And containers of liquid deuterium will speed outward to supply the new powerplants and fulfill the earlier functions of freight cars of coal and tankers of oil—helping to power man's conquest of hunger and misery and blasting his way to the stars.

Phantom Faces

CONCEALED IN the familiar objects of the everyday world are strange, amusing—even terrifying—surprises. In varying degrees, Los Angeles photographer Jack B. Kemmerer experienced all these sensations recently during a ride in a tiny sports car. He had a close, face-to-face meeting with the taillights of a larger, standard-make auto.

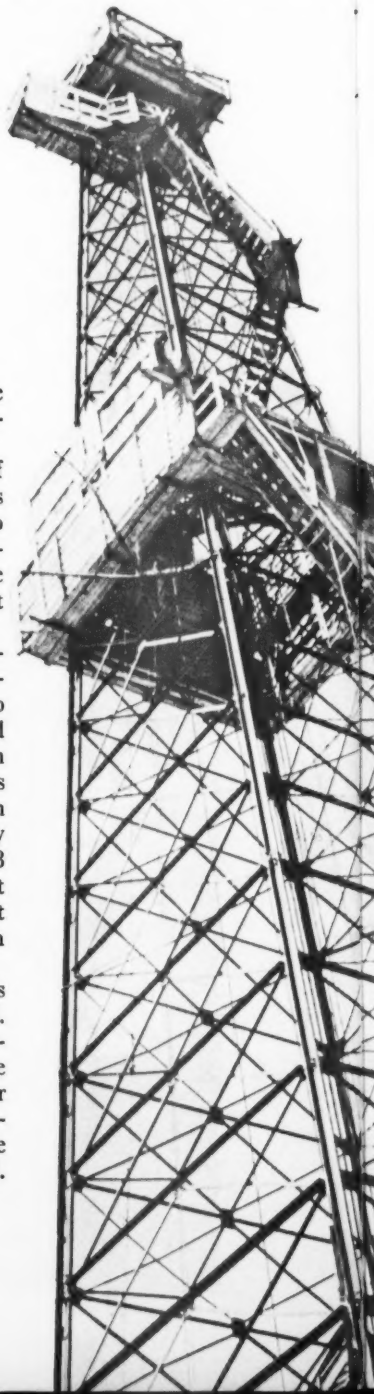
The accompanying photographs are samples of the collection he has since made as part of an investigation into the hidden nature of taillights. He suggests that the search for "phantom faces" is a game any number can play.



SOVIET OIL OFFENSIVE

By EDWARD McGRATH

Petroleum has become the principal weapon in Russia's economic assault on the West.



STEEL DRUMS and shipping cases on a wharf in Bombay . . . a tanker slipping down the ways of a Japanese shipyard . . . a pipeline snaking through a cavernous Alpine tunnel . . . a new service station along a sun-baked road in Kenya.

These are weapons of the cold war, a war fought without rules or quarter on a global scale, a war fought with oil.

The oil is rich black crude, bled from the mountains of Azerbaidzhan, pumped from the fertile Valley of the Volga, tapped from beneath the floor of the Caspian Sea. It is oil in flood, undermining the economic supports of free world nations, threatening the defensive strength of the Western alliance.

The implications of Russia's oil offensive have only recently been recognized by Western leaders. Within the past few months two U. S. Senators have sounded the warning.

Hubert Humphrey of Minnesota characterized the Soviet petroleum program as "economic banditry." Russia is using oil, he said, to sow disunity among the nations of the free world. A. S. Mike Monroney of Oklahoma said flatly: "The Soviet's principal weapon in the economic war is oil. The Soviet economic offensive will succeed or fail on the basis of the amount of Soviet oil which can be exported . . . ."

The Russians have been aware of their rich oil resources since the days when Baku oil lighted the tents of Marco Polo. They were quick to find their oil deposits, slow to develop them. But in the last 10 years they have made up for lost time.

From 1950 to 1960 world oil production doubled; but Soviet oil production quadrupled, from 700,000 barrels to almost 3 million barrels a day (second only to the U. S. production of 7 million barrels a day). The Soviet Union's proved reserves have skyrocketed from 5 billion barrels to 25 billion barrels. By 1965 Russia expects to be producing 4.8 million barrels daily. And in a recent speech Nikita Khrushchev boasted that Soviet oil production would soar as high as 13.6 million barrels daily by 1980.

This accelerated production provides the Soviet Union with a surplus of oil. Russia's own internal demand is not geared to such a massive output. The average Soviet citizen needs no gasoline or motor oil—he cannot afford nor obtain an automobile. Demand for fuel oil is slight, since most buildings are heated with coal.

Many Russian factories are still at a relatively primitive, pre-petroleum stage of development.

Thus the Soviet Union has oil in abundance for export. And the market is ready and waiting. New nations need fuel to power their developing industries; established nations need fuel for their enlarged and expanded industries. World demand for fuel is soaring.

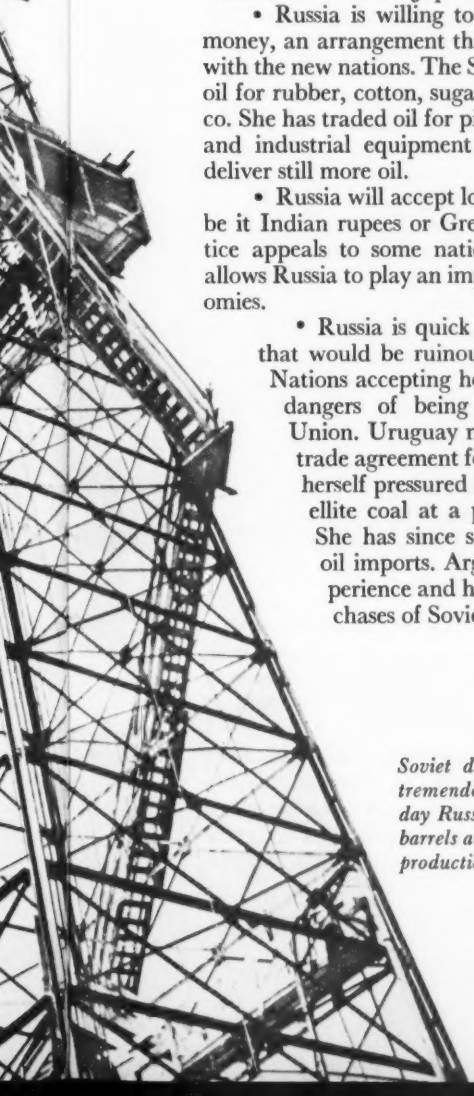
How does the Soviet Union use oil as an economic weapon? The answer provides a significant insight into her deadly capacity for fast and effective action.

• Russia offers oil to Western nations at prices deliberately slashed to undercut free world prices. The offer is tempting to nations with little ready cash. Balancing the low rates that are bait to the West are the high prices the Soviets demand for oil sold to satellite nations. East Germany, for example, pays twice the price that the Russians ask of West Germany. And nations that come to rely on a heavy supply of Soviet oil are liable to find prices rising: Greece had to accept a 2-cent-a-barrel increase in price at the same time Russia was cutting prices 10 cents a barrel to lure Japanese orders.

• Russia is willing to accept goods instead of money, an arrangement that is particularly popular with the new nations. The Soviet Union has bartered oil for rubber, cotton, sugar, coffee, fish, and tobacco. She has traded oil for pipeline materials, tankers, and industrial equipment that, in turn, help her deliver still more oil.

• Russia will accept local currency as payment, be it Indian rupees or Greek drachmas. This practice appeals to some nations, though obviously it allows Russia to play an important role in their economies.

• Russia is quick to offer long-term credit that would be ruinous to a private company. Nations accepting her offer soon discover the dangers of being indebted to the Soviet Union. Uruguay negotiated a $100 million trade agreement for Russian oil, then found herself pressured into accepting Soviet satellite coal at a price well above market. She has since sharply curtailed Russian oil imports. Argentina had a similar experience and has also cut down her purchases of Soviet oil.



Soviet drilling rigs have opened up tremendous petroleum reserves. Today Russia produces almost 3 million barrels a day—second only to the U.S. production of 7 million barrels a day.

• Russia has offered to help nations develop their own oil resources. Soviet oil exploration crews are now scrambling over the hills of Ethiopia and Afghanistan. Soviet engineers are directing the construction of refineries in India and Ceylon—refineries designed to supplant Western-owned refineries that have refused to process Soviet oil.

Successes of the Soviet oil offensive to date show a pattern that reveals the true motives behind the campaign. Khrushchev has said it: "We declare war upon you in the peaceful field of trade."

The Soviets use their oil trade to disrupt friendships and alliances. When the dispute between Great Britain and Iceland over fishing rights was at its peak in 1959, the Russians acted with precise timing. Iceland accepted a Red oil-for-fish offer, and today Iceland gets all her oil from the Soviet Union. Russia is also using oil in an effort to woo Pakistan away from her Western allies.

Finland presents a prime example of the Soviet use of trade as a political weapon. Beset with Soviet claims for reparations following World War II, the Finns worked long and hard to meet the high demands of their menacing neighbor. With most of its produce channeled into Russia, the Finnish economy grew dependent upon Soviet trade. Then in 1958—with the purpose of shaking the Finnish economy and toppling the anti-Soviet government—the Russians suspended trade with Finland. The government fell and today Finland is tied even more tightly to the Soviet Union by chains of trade. More than 75 percent of Finland's oil requirements are met by the Soviet Union.

The Soviet oil export drive has other important ramifications.

For oil-producing nations, it represents a threat to their very economic livelihood.

For all nations with which the Russians deal, it represents an inducement to nationalize their petroleum industries. The Russians encourage nationalization by making deals on a state-to-state basis wherever possible.

For the Western World, it represents a threat to the system of mutual defense. Within the NATO alliance itself, member nations today rely on the possible aggressor for a substantial portion of the petroleum so essential to the conduct of modern military operations.

Russia's use of petroleum as a weapon of conquest has been on a worldwide basis. The following case histories demonstrate the effectiveness of this weapon in Soviet hands.

CUBA

In the winter of 1959-60, nearly a year after Fidel Castro's rise to power, Cuba was an island aflame with violence. The toll of firing squad victims

mounted daily as the 26th of July revolutionaries continued to purge their ranks. Anti-Americanism was fanned to fever pitch by Castro's speeches.

Armed and bearded Cubans marching through the streets of Havana and Santiago to shouts of *"Cuba si! Yanqui no!"* could look out to the suburbs and see the towering oil refineries that were among Cuba's last links with freedom. Erected by American and Canadian companies, the refineries played a vital role in the Cuban economy.

Fuel-poor, the island had come to rely on imported oil, most of it Venezuelan crude brought in by American tankers. The heavy crude was processed in refineries representing a $75 million investment by North American companies. The refineries provided a source of employment and technical training for hundreds of Cubans.

Early in 1960 Soviet First Deputy Premier Anastas Mikoyan visited Castro and offered a tempting barter arrangement: 10 million barrels of Soviet oil for 5 million tons of Cuban sugar. But the Canadian and American refineries refused to process the Russian oil.

Cuban economic chief and guerrilla warfare expert Ernesto "Che" Guevara demanded that the refineries agree to process the Soviet oil. The refiners were adamant: accepting the crude would block out Venezuelan oil and place American and Canadian refineries in the position of serving Soviet ends.

Russia pressed the Cubans still harder. Guevara threatened to nationalize the refineries. The refinerymen stayed on the job but evacuated their families.

Then Castro ordered the delivery of two bargeloads of Soviet crude oil. When the barges arrived at the Santiago refinery, the plant was deserted. Armed *barbudos* clattered through the refinery, now the property of the revolutionary government of Cuba.

Soviet crude oil began to flood into the island in late summer of 1960. Cuban sugar was loaded for Russian delivery, as the Russians took full and speedy advantage of their trade monopoly. Castro had to stand by and accept the value the Soviets placed on the sugar: a painful 2¾ cents a pound less than what it had cost the Cubans to produce.

Today Cuba receives all her oil from Russia—more than 80,000 barrels daily. The island has become dependent on Russia for economic survival. Red oil has helped create a Soviet satellite just 90 miles from the coast of the United States.

ITALY

Few Russian moves in the oil offensive are as ominous as those involving E.N.I. (*Ente Nazionale Idrocarburi*), Italy's National Hydrocarbon Agency. They have made an important NATO member dependent on the Soviet Union for more than 20 percent of her essential fuel supply. Even more alarming, Italy is being used as a middleman to pump Russian oil into other Western nations.

The history of Russian oil in Italy dates back to 1960, when E.N.I. Chairman Enrico Mattei flew to Moscow to sign a contract with the Soviet Union. Italy was to accept 87.6 million barrels of Russian crude over a period of four years. In return, the Italians were to supply the Soviets with synthetic rubber, steel pipe, and pipeline equipment. These materials are essential to the pipeline network that the Russians are constructing to pump Red oil to Asia and Europe.

In the last year the trade web has grown stronger and more complex. Italy has become the free world's largest customer for Russian oil. And she is now building six 48,000-ton tankers for the Soviets.

E.N.I. may be the shield behind which Soviet oil will be pumped into those Western nations that have hitherto strongly resisted the overtures of the Russian traders. In Great Britain, for example, Mattei has contracted to erect a chain of service stations.

This agreement may result in British stations distributing gasoline and motor oil made in Italy from Russian crude. E.N.I. already operates dozens of service stations in Africa, Germany, Austria, and Switzerland.

An E.N.I. pipeline from Trieste to Munich is now under construction. This will provide another outlet for Russian oil. This same line runs through tunnels in eastern Switzerland; it has outlets to serve potential Swiss purchasers.

The Soviet Union uses petroleum to forge economic and political links with fuel-hungry underdeveloped nations. Nikita Khrushchev is seen with the leaders of two such nations: Fidel Castro and Jawaharlal Nehru.

INDIA

With the development of her economy, India has become a heavy importer of crude oil, her traditional source of supply being the Persian Gulf. Her refineries were financed and built by Western oil companies.

But India is interested in oil at the cheapest price. And she was interested when, in 1960, Russia offered her crude oil at prices as low as 20 percent less than the price of the Persian Gulf crude. Shrewdly using an Indian-Soviet trade agreement, the Russians expressed a willingness to accept rupees; Western companies required a more stable currency.

The Indian Government found the deal tempting and proposed that the Western oil companies process the Soviet crude in their India-based refineries.

It was the Cuban situation all over again. But this time the Western companies took a new and drastic approach. They offered a 12.5-percent discount on Persian Gulf oil. Sensing the bargain, the Indian Government agreed but continued to buy (with rupees) refined products from Black Sea ports —a trade that soared to more than 2 million barrels in 1961.

To prevent complaints from other customers, Western companies had to reduce Persian Gulf crude prices by 7 percent, weakening the price structure in one of the free world's key oil-producing regions, the Near East. India promptly objected on the grounds that she was being done out of part of her discount.

The Russians, despite their temporary setback, continued their efforts to infiltrate the Indian market. They sent Rumanian technicians to help the Indians build a state-owned refinery at Nunmati; they are helping the Indians build two others, at Barauni and Cambay; they sent engineers to help in the exploration for oil in India. The Indian Government has barred expansion of Western-owned refineries. Thus there is little reason to believe that the Russians will be content with trade in refined petroleum products. Inevitably they will press to have the new refineries accept Russian crude.

The history of Soviet oil penetration in Cuba, Italy, and India demonstrates the effectiveness of this economic weapon; and there are indications that Russia plans to continue making maximum use of it. Norway and Denmark are currently being pressured by the Soviets to increase their imports of Red oil. Belgium has been offered cut-rate prices on Russian crude. Increasing quantities of Soviet oil are being shipped through the new "Friendship Pipeline" to the satellite nations.

The aggressiveness of the Russian oil program has been underlined by recent developments in the Near East. Oil-producing nations there raised loud objections to the Russian invasion of the oil market; they pointed out that it undercut world petroleum prices, directly affecting their own economies. Nevertheless Russia continues to woo these nations' neighbors. A single case in point: Egypt today receives more than half her oil requirements from the Soviet Union.

What can be done to meet the Red oil menace? The answer may emerge from discussions now going forward within the Western World. The nations of the European Economic Community, for example, are giving the matter careful consideration.

The United States has undertaken a two-pronged educational program overseas. American military representatives are briefing NATO members on the dangers inherent in the Soviet oil offensive. U. S. diplomatic missions have embarked on a similar program.

Several weeks ago the Federal Government called for an emergency study of the Soviet oil offensive with emphasis on its effects on free world nations. The study is to be made by the National Petroleum Council, an industry advisory group to the Secretary of the Interior. A report is expected within a month. It will provide a basis for further action on this new and critical battlefront of the cold war.

by J. Edgar Hoover

The director of the FBI tells of the role the nation's service station dealers have played in combating lawlessness. A noted example: The Lindbergh Kidnaping Case.

Volunteers in the War on Crime

A SERVICE STATION attendant on September 15, 1934, scribbled "4U-13-41" on a $10 gold certificate. It was a simple act; yet it will be remembered for many years.

The figures recorded on the bill were an automobile license number. Four days later they brought about the solution of one of the most famous criminal cases in the history of the United States—the Lindbergh Kidnaping Case.

I can well remember how my spirits soared when news of the discovery of the bill and the significance of the notation on it reached me. No doubt every law enforcement officer in the nation and countless millions of citizens also felt a sense of relief when they learned that the kidnaper of little Charles A. Lindbergh, Jr., had been caught.

The case had been under investigation for 2 years 6 months and 18 days when the break finally came.

Groundwork for the break had been laid months earlier when the FBI issued a pamphlet listing the serial numbers of bills contained in the $50,000 ransom, $40,000 of which had been in gold certificates. Copies of the pamphlet were furnished to banking institutions and numerous business establishments, including service stations, in the New York area.

A total of 296 $10 gold certificates and one $20 gold certificate, all part of the ransom, had been discovered at the Federal Reserve Bank in New York on May 2, 1933, following the President's order that all gold certificates be returned to the Treasury. Exhaustive investigation regarding these bills proved fruitless.

On August 20, 1934, another gold certificate from the ransom money was discovered, and 15 more were turned up in the New York area during the next few weeks. Each was carefully traced back to the business establishment where it had been passed, but there the trail always ended.

About 1:20 p.m., on September 18, 1934, the New York FBI Office received a telephone call from an official at the Corn Exchange Bank and Trust Company. A teller at the bank had just found a $10 gold certificate, one of the ransom bills.

Immediately, FBI Agents and representatives of the New York City Police and New Jersey State

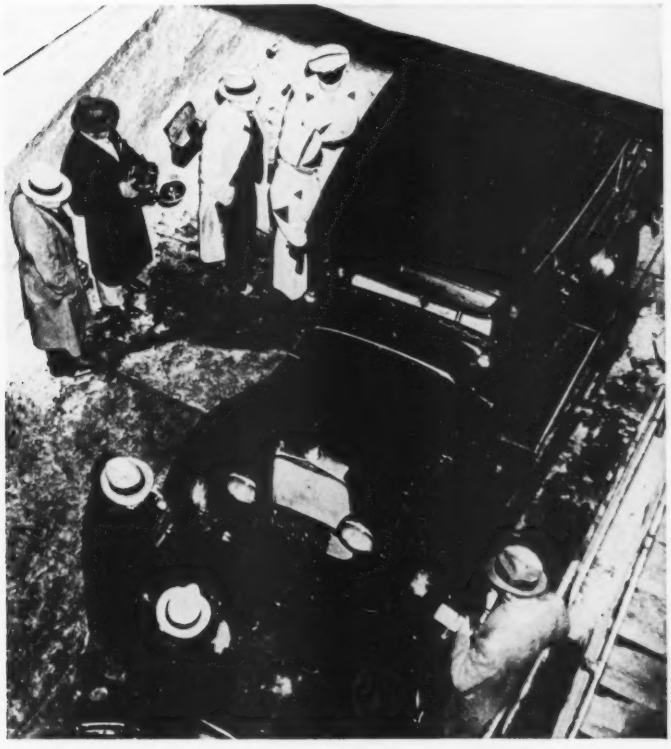
Police proceeded to the bank. Examining the bill, they quickly spotted the notation on it, and their hopes rose. The teller was unable to recall specifically which customer had left the bill; thus the investigators left the bank with the addresses of several depositors.

One of the depositors was an employee of a service station three blocks away at 127th Street and Lexington Avenue. The investigators showed the bill to the station manager, Walter Lyle. Of course he remembered it; he had personally written the license number on the bill. He and another attendant described the customer who had presented the bill in payment for five gallons of gasoline. From their vivid description there was little doubt that this was the same man who had previously passed ransom bills and had received the ransom on April 2, 1932.

A check with the New York State Motor Vehicle Bureau revealed that the license whose number had been copied by Lyle onto the ransom note had been issued to Richard Hauptmann, 1279 East 222nd Street in the Bronx. The house was placed under observation, and the next morning Bruno Richard Hauptmann was followed from his residence and arrested as he was driving his car along a busy New York street. Convicted in a New Jersey court, Hauptmann was executed on April 3, 1936.

Such excellent assistance to law enforcement agencies from service station personnel is not a rarity. The very nature of a service station attendant's work provides him with frequent opportunities to give valuable aid in the fight against crime.

Of course, neither the FBI nor any other law enforcement agency wants or expects a private citizen to jeopardize his safety in helping to fight crime. The reporting of information indicating criminal activity, however, is expected, desired, and needed if the current upward trend in crime is to be reversed.



Information provided by an alert service station attendant led police to this 1930 Dodge sedan and its owner, Bruno Richard Hauptmann.

Spotting Stolen Cars

In a recently published booklet the FBI has set forth some guides to enable service station personnel to recognize and cope with certain types of crime. The following signs of possible auto theft (250,000 cars are stolen each year in this country) are taken from that booklet:

1. **Drivers who do not "fit" the car they are operating.**
2. **Vehicles being operated without ignition keys.**
3. **Broken or newly replaced vent glass. Replacement glass will not contain the original factory trademark in the lower corner.**
4. **Altered or damaged motor number or vehicle identification number plates—or the absence of these items.**
5. **New license plates in the middle of a registration period, dirty plates on shiny cars, new tag bolts on old license plates, or the so-called snap-on tags.**
6. **Persons offering to sell automobiles or accessories at less than their regular value.**

Aiding in law enforcement is one of the best ways for law-abiding citizens to protect themselves from the criminal hordes.

A major obstacle in gaining complete cooperation from private citizens is the feeling by far too many people that information they possess is unimportant or inaccurate. No evidence or indication of a crime is unimportant to a trained investigator. He also is the best qualified person to determine the accuracy of information.

FBI files contain numerous examples of vital aid rendered by service station personnel. Many of the tips seemed minor when considered alone, but coupled with other information proved of vital importance to the solution of particular cases.

A brutal murder in a southern state was brought to a speedy solution through the aid of a service station attendant and the operator of a service garage. The battered body of a woman had been found in the brush at a roadside park. Her automobile was missing, and there was an indication that it had been stolen by the murderer and transported interstate, a crime within the jurisdiction of the FBI.

Learning the probable route the woman had followed in her travels, FBI Agents began a canvass of various establishments along the highway. A service station attendant recalled having seen the woman on the day before her body was discovered. He related that she was accompanied by a young man in an Army uniform—she had departed on the trip alone.

Five days later a service garage operator reported having towed in a disabled car that had been abandoned along the murder victim's route on the same date she was seen with the young soldier. An Army bag bearing a name and an Army serial number was found in the car. Pictures of the soldier whose name appeared on the bag were secured, and these were identified by the service station attendant as likenesses of the man with the victim. When arrested, the suspect admitted the murder. He later was sentenced to life in prison.

A New Jersey service station attendant in the fall of 1954 provided information which led to the solution of a series of vicious kidnapings. For a number of weeks unsuspecting motorists had fallen victim to two hitchhiking sailors in New Jersey, New York, Delaware, and Pennsylvania. Five of the cases involved Federal kidnaping violations since the victims were transported across state lines.

In several of the cases the sailors, after robbing the motorists who picked them up, locked their benefactors in the automobile trunk, and drove around in the stolen car. On one such occasion one of the sailors stopped at a New Jersey service station for gas. The other sailor, following in the kidnapers' own automobile also stopped for gas. The victim created a commotion in the trunk of the first car, a commotion that was heard by a station attendant. When he mentioned the noise, the sailors sped from the station.

As the sailors' own vehicle started to move, the servicing attendant tried to pull off the license plate with the gas hose. Although he failed in this attempt, the hose nozzle scratched the back of the automobile. He also marked the departing car by throwing the gas cap against it. This incident was promptly reported, and the attendant supplied a good description of the automobile and partial license number. An attempt to check the partial license number proved fruitless; but FBI Agents, armed with the description of the vehicle and the marks caused by the attendant, soon located it during a detailed search of the area near the Philadelphia Navy Yard.

The owner of the car subsequently admitted his part in the crime wave and implicated his partner. Both were charged with seven counts of kidnaping and four counts of interstate transportation of stolen motor vehicles. Convicted in Federal court, both were sentenced to an indefinite prison term.

The FBI has long recognized the aid service station dealers can give in such matters. Just this year we issued a booklet entitled *How Service Stations Can Help Law Enforcement,* which has already been distributed to thousands of dealers.

In this booklet we point out certain specific areas wherein service station personnel can help law enforcement agencies. We cover such matters as auto theft, fraudulent checks, hit-and-run cases, and burglaries.

The introduction to the booklet sums up much of what I have been saying. It reads, in part: "The fight against crime is the responsibility of every honest citizen. The greatest possible deterrent to crime is an aroused public which refuses to shrug off criminal activities with the trite expression that 'it's none of my business.' "

We at the FBI have seen that the men who operate service stations can be and have been invaluable aides in the unending struggle against crime.

PHOTO AND ART CREDITS

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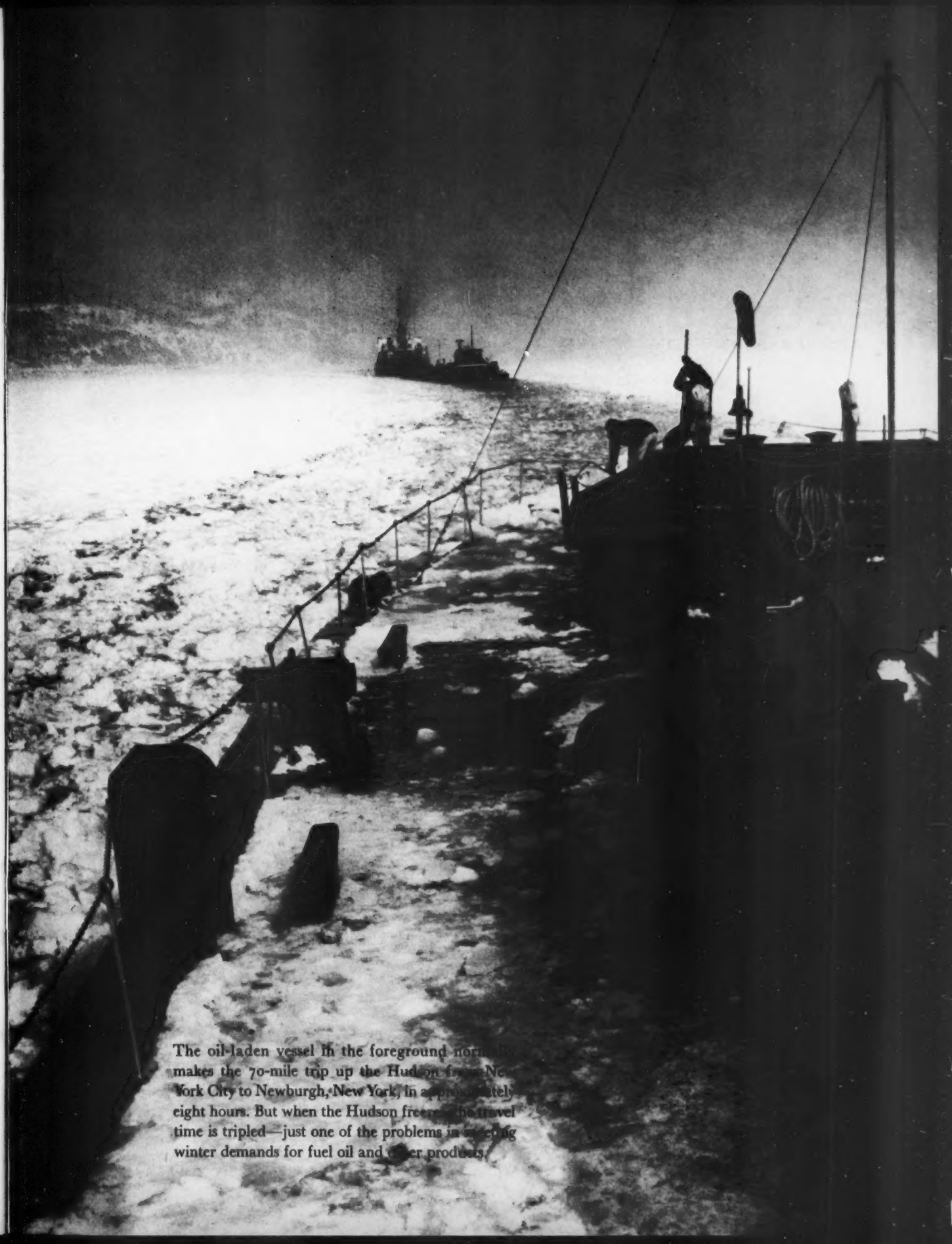

The oil-laden vessel in the foreground normally makes the 70-mile trip up the Hudson from New York City to Newburgh, New York, in approximately eight hours. But when the Hudson freezes, the travel time is tripled—just one of the problems in meeting winter demands for fuel oil and other products.